

Technology Review

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Lester Thurow on
INVESTING IN THE
BUILDING BLOCKS
OF A HEALTHY ECONOMY



◆ THE GREAT INTERNET TAX DRAIN ◆ DOWNSIZING INFRASTRUCTURE ◆ MAGNETS ON THE RISE ◆
◆ TRUTH AND BEAUTY IN SCIENTIFIC PHOTOGRAPHY ◆

technology review

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futuristic,

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well, virtual?"

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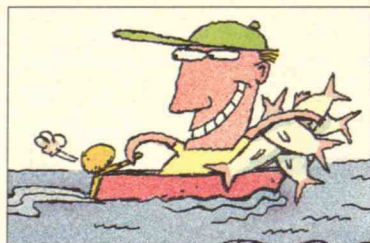
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Survival-of-the-fittest capitalism, under which individuals fend for themselves, won't pay off for either industrialists or employees in the coming era, says the prominent economist and prolific author. He maintains that investing in the fundamental building blocks essential to a healthy economic system will require a thoughtful mixture of public commitment and private initiative.



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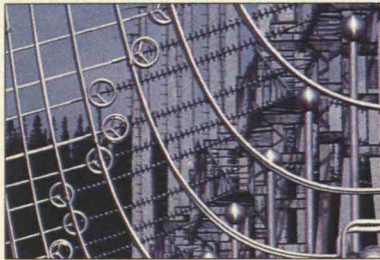
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Images designed to stimulate the imagination rather than simply record data not only entice viewers of diverse backgrounds. Aesthetically pleasing visuals can also do a more effective job of conveying the intricacies of physical reality.

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Richard Saffran, in the Bose® Life Test facility.

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TEN YEARS AFTER

*Our leaders
can prevent another
Chernobyl only if they
go beyond talk.*

ON April 26, the world commemorates the tenth anniversary of the worst nuclear accident in history. On that day in 1986, a violent explosion at the Chernobyl Nuclear Power Plant in Ukraine completely destroyed Unit 4, spreading radioactive contamination throughout Europe.

The word "Chernobyl" has since come to symbolize the catastrophic potential of blind technological progress. According to a recent report of the U.N. secretary-general, some 160,000 square kilometers—an area the size of England, Wales, and Northern Ireland combined—have been heavily contaminated by the disaster, and an estimated 9 million people affected. Almost 400,000 people have been forced to leave their homes, many never to return. And serious health consequences continue to be observed, including a dramatic rise in thyroid cancers in children.

One week before the anniversary of the Chernobyl accident (right around the time you receive this magazine), Presidents Clinton, Yeltsin, and the G-7 leaders are scheduled to gather in Moscow for an unprecedented summit on nuclear safety and non-proliferation. Both the anniversary of Chernobyl and the Nuclear Safety Summit should prompt world leaders to take the substantive steps necessary to avert further nuclear disasters.

Such steps are essential because 10 years after Chernobyl, 67 Soviet-designed nuclear reactors continue to run in Eastern Europe and the former Soviet Union, and at least 26 of them—RBMK (Chernobyl-type) reactors and VVER-440 Model 230s—are known to pose serious safety risks that cannot be "fixed" with technical upgrades. RBMKs have an irreparable design flaw that makes their operation unstable at low power, or if coolant is lost, and allows for a runaway power surge like the one that caused the Chernobyl explosion. RBMKs also use a graphite moderator, which can burn, to facilitate the nuclear chain reaction. Neither reactor type has Western-style secondary containment that would prevent the release of radioactivity in the event of an accident. Both reactor designs also lack adequate emergency core cooling systems to prevent overheating that could lead to a meltdown. Adding new containment and emergency core cooling systems to either model would be finan-

cially prohibitive and, according to many nuclear engineers, technically infeasible.

Despite the inherent nature of these problems, most of the international nuclear-safety assistance in the region since Chernobyl has been devoted to short-term technical upgrades designed to improve fire protection, quality of training of plant personnel, and instrumentation and control systems. Although better than nothing, these measures are still akin to putting a Band-Aid over a compound fracture.

In 1992, the G-7 pledged at their yearly economic summit to work to shut down the most dangerous reactors by the year 2000, and they commissioned a study by the World Bank, the European Bank for Reconstruction and Development, and the International Atomic Energy Agency to look at alternatives. This group concluded in its June 1993 report that it would be possible to meet electricity demand in Eastern Europe and the former Soviet Union while closing the higher-risk plants by the mid-1990s. Yet not one has been permanently shut down.

The bottom line is that without sufficient financial commitment from the West for developing replacement power to meet these countries' energy needs, any debate on closing these facilities is moot. While the price tag to replace the unsafe plants will be substantial in the short run, prevention of future accidents will be well worth the investment.

Unfortunately, the primary reactor-safety item on the Nuclear Safety Summit

agenda appears to be ratification of the International Convention on Nuclear Safety. This treaty, the result of three years of negotiations, is all rhetoric—exhorting individual countries to establish their own regulations—and has no teeth. It does not require phaseout of nuclear plants with the highest accident risks, it does not establish substantive technical or procedural standards by which nuclear installations should be evaluated, and it does not provide a framework for independent third-party oversight of nuclear facilities.

Our leaders can do a lot better. Specifically, the Natural Resources Defense Council, in cooperation with Alexei Yablokov, chair of Russia's Ecological Security Commission, has assembled a distinguished international task force of nongovernmental nuclear and energy experts to issue recommendations to the G-7 and Russian leaders that go beyond the agenda of the Nuclear Safety Summit and provide substance. Specifically, the task force recommends that the G-7 and Russia: • Identify, on an urgent basis, power-replacement options for each unsafe nuclear plant in Eastern Europe and the former Soviet Union. • Create a multilateral Sustainable Energy Revolving Fund, capitalized at a level of \$10 billion (largely by G-7 members). • Prioritize the most dangerous reactors for shutdown by no later than the end of 1996, thus establishing the order in which countries would receive assistance through the fund. • Provide technical and financial support for establishing regulatory structures and markets capable of encouraging a wide range of energy alternatives.

The task force is building on a recent and important precedent for Western intervention and funding. A December 1995 agreement between the G-7 and Ukraine, regarding the potential shutdown of the two remaining units at Chernobyl in exchange for replacement power, at least establishes a principle that could ultimately be extended to all the other unsafe reactors in the region. Acting on the task force's recommendations will be a further critical step in the right direction. ■

—THOMAS B. COCHRAN
AND MIRIAM B. BOWLING

The authors are senior scientist and research associate, respectively, at the Natural Resources Defense Council in Washington, D.C.

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Letters

THE GREAT EV DEBATE CONTINUED

"The Electric Car Unplugged" (*TR January 1996*) by Richard DeNeufville et al. contains two particularly egregious mischaracterizations of California's zero-emission vehicle program. Contrary to the authors' assertion that electric vehicles (EVs) merely displace emissions, EVs will indeed reduce overall emissions, thanks to California's clean electrical generating system. In fact, emissions in the Los Angeles area from charging EVs will be only one-tenth those generated by ultra-low-emission gasoline vehicles. More importantly, with no on-board emission-control equipment that deteriorates with use, EVs will always have zero tailpipe emissions and zero fuel-evaporation emissions—regardless of how they are driven and maintained.

The authors correctly note that EVs don't offer 300 miles of range per charge. However, when used by a household, EVs can effectively complement the gasoline car. Consider that 85 percent of drivers surveyed in three metropolitan areas drive less than 75 miles each day, with 70 percent driving fewer than 50 miles each day.

It is important to note that although the number of EVs will be small in the early years, their introduction is only the first step. As innovative future technologies such as fuel-cell vehicles and hybrid-electric vehicles are introduced, the gradual electrification of a portion of the vehicle miles traveled in California will have a profound and lasting impact on air quality.

JOHN D. DUNLAP III
Chair
Air Resources Board
State of California

General Motors's forthcoming production and sale of EVs in nine U.S. cities will put your authors' pessimistic assessment of EV technology to the test. But the authors' criticism of attempts to "legislate the results of research" is clearly far too simplistic, as many successful technologies have been developed in response to environmental laws.

A recent case is the development of substitutes for chlorofluorocarbons, chemicals that have been regulated because of their role in ozone depletion. When the international community agreed to reduce their use in 1987, there were no known substitutes. Regulation based on "available technology" would have been impossible. However, environmental necessity proved to be the mother of invention: as of January 1, 1996, virtually all CFC uses have been eliminated.

A related issue is that there is no easy proof of feasibility other than widespread commercial use. At the time that regulations on catalytic converters and air bags were proposed, for example, the auto industry vociferously disagreed that they were "available." Thus, establishing market pull may sometimes be justified to overcome the barriers to technological innovation.

ALAN S. MILLER
Executive Director
Center for Global Change
College Park, Md.

Several important issues raised by the authors deserve comprehensive analysis before EVs are routinely accepted as a solution to air pollution. If the electrical energy for EVs is produced by power plants run on fossil fuels, these vehicles may be larger polluters than conventional autos. The Union of Concerned Scientists found that the average auto emits about one pound of CO₂ per mile driven. Experience with EVs at Brookhaven National Laboratory shows that EVs are responsible for roughly 1.6 pounds of CO₂ emissions at the power plant for every mile driven.

J. RICHARD SHANEBROOK
Professor
Department of Mechanical Engineering
Union College
Schenectady, N.Y.

Contrary to the authors' implications, EV technology is already capable of meeting many motorists' daily transportation needs and providing a delightful experience. The biggest barrier to EV commercialization is not tech-

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nology, it is market acceptance. Ironically, the California mandate raised barriers to market acceptance by inspiring many articles such as yours. With the mandate all but gone, there is now no reason to magnify EV shortcomings or minimize its potential to improve air quality.

The authors provide much negative information about EVs but do not seem to have looked very hard for the good news. There is plenty out there. The GM EV1, which will hit the showrooms this year, has been well-received by all who have driven it. Chrysler will offer its electric minivan in 1997. Ford has claimed that, except for the up-front price of batteries, EVs will cost the same as conventional cars when produced in volume—not twice the cost as predicted by your authors' model.

One California company, AC Propulsion, produces a remarkable four-seat EV based on the Honda Civic. According to public testimony delivered to the staff of the California Air Resources Board, this vehicle accelerates to 60 mph in 6.2 seconds, can range 70 miles at 70 mph, recharges from any available outlet, and uses commercial lead-acid batteries. It provides 200 horsepower and weighs 3,200 pounds, but is energy efficient in part because advanced regenerative braking recaptures 30 percent of the energy used in urban driving. After almost 35,000 miles, the prototype's total operating costs are under 8 cents per mile for batteries and 2 cents per mile for electricity—about the same as fuel and oil costs for a gasoline car of equivalent performance.

THOMAS GAGE
TERA Consulting
Sunnyvale, Calif.

There are several reasons besides smog to change the way we power cars. First, the U.S. negative balance of trade includes about \$50 billion per year for imported oil. The amount of oil we

import is about the same as the amount of oil we refine to make gasoline. Second, oil is too valuable to future generations for us to keep burning it as an inefficient source of energy for personal vehicles. Finally, considering the possible dangers of global warming, we should work toward eliminating combustion as an energy source, which is ultimately possible with EVs.

THOMAS HANSON
Newhall, Calif.

Although the authors accurately evaluate the technical deficiencies that will deter consumer acceptance of the EV, they omit the importance of marketing in convincing customers that the EV is a cost-saving product for niche uses.

When an EV replaces a conventional car for short trips, the owner's costs are reduced because conventional car mileage is poorest and emissions highest with cold starts and repeated start-and-stop operations. And because EVs can last 15 years, their depreciation is low.

A consumer-acceptable EV must be more than the bare-bones vehicles produced thus far. Fortunately, most accessories do not require much energy. The EV must also be price-competitive—probably \$10,000. This is an achievable goal, considering the EV's inherent simplicity.

WILLIAM H. SHAFER
Vice-President
Fox Valley Electric Auto Association
River Forest, Ill.

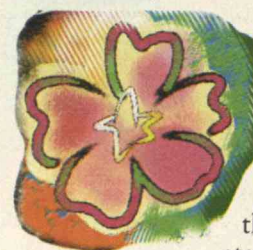
The authors do not properly lay out the case for using EVs to commute. EVs now available provide essentially maintenance-free travel over ranges limited only by battery storage capacity. My EV—I have been driving one to Boston for five years—uses lead-acid batteries and routinely achieves 60 miles on a single charge. Although this is reduced to 40 miles in 20-degree weather, I travel only 24 miles round trip.

Small nickel-metal hydride batteries have been available for laptop computers for more than a year. General Motors is now involved in a joint venture to manufacture these batteries for cars. A recent test of a vehicle using these batteries travelled 190 miles at 60 mph on a single charge with headlights and air conditioning operating 50 percent of the time, and 245 miles at 45 mph on a single charge.

WALTER P. KERN
Canton, Mass.

DIVERTING CONVERSATION

In regard to Professor J. Richard Shanebrook's letter on nuclear power (*Letters to the Editor*, *TR* November/December



1995): it is not clear how conversation will solve our energy and overpopulation problems. Even if all the hot air generated by our politicians

could be harnessed, I doubt that it could keep the pipes from freezing in our government buildings. Does he intend that talk will interfere with sex enough to keep procreation under control?

PETER J. DAVIS
Paris, Va.

We apologize for the typographical error. Professor Shanebrook advocated *conservation*.

CORRECTION

"A Down-to-Earth Approach to Clean Production" (*TR* February/March) should have credited Douglas B. Holmes for the design of the flow chart on pages 48-9. We regret the omission.

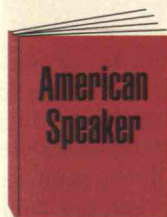
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REVIEW

Applause, Applause

Anyone can win over a tough audience, says hailed speechwriter. Just ask Lee Iacocca.



AMERICAN SPEAKER

Your Guide to Successful Speaking

Aram Bakshian, Jr., Editor
Georgetown Publishing House—600 pages

The difference between success and failure, writes Aram Bakshian, Jr. in this remarkable new resource for public speakers, is the ability to communicate clearly and effectively. Never has this been more true than in today's intensely competitive business climate.

Bakshian should know. Speechwriter to "The Great Communicator" himself, Ronald Reagan, as well as to two other former presidents and the heads of several major corporations, Bakshian has witnessed the rise and fall of international leaders based on their ease—or lack of ease—on the podium. Anyone can master the art of speaking in public, Bakshian says, "in the last analysis, the spoken word is still king."

Fear and loathing of the rubber chicken circuit have long plagued public figures.

"No one knows how I hate making speeches," President Calvin Coolidge once complained to a friend.

Bakshian tackles head-on the challenges of public speaking in *American Speaker*. "As with alcoholism," he writes, "there is no known cure for stage fright. You're either a 'chronic' sufferer or a 'recovering' sufferer." In either case, it's easy to minimize that suffering—or even turn it into an advantage, as he deftly outlines. As Carroll O'Connor, the legendary "Archie Bunker," put it, "A professional actor has a kind of tension. The amateur is thrown by it, but the professional needs it."

Perhaps the best contemporary example is Lee Iacocca, who saved the Chrysler Corporation by using his enormous talent as a speaker to win the support of the Congress, the White House and the American people for the biggest corporate bailout in history. Iacocca himself attributes his

business success to speaking. In his autobiography he writes: "I've seen a lot of guys who are smarter than I am and a lot who know more about cars. And yet I've lost them in the smoke. Why? Because I'm tough? No...You've got to know how to talk to them, plain and simple."

Business is the single biggest rhetorical arena. From simple retail sales spiels to sensitive boardroom presentations, speech keeps the wheels of commerce turning. In making a first impression, Bakshian writes, "Your appearance can raise expectations, but what you say and how you say it will determine how people evaluate you." A good speaker is always in demand. At events from business conventions to weddings, "a good speaker not only adds to the occasion, he also benefits from 'free advertising' that adds to his stature in the community and attracts future business."



Unusual for a book or periodical of any kind, *American Speaker* is more of a personal mentor—a do-it-yourself guide designed to save hours or days of preparation time, or conversely, an enormous bill from a

professional speechwriter or "coach."

It's a clever, accessible concept: a three-ring binder crammed with hundreds of pages of material on every imaginable aspect of public address: body language, delivering an inspiring eulogy, antidotes to nervousness, using humor, developing a powerful speaking voice, or engaging the audience in a positive question-and-answer session. Bakshian offers sensible, uplifting advice for every occasion, from the Thanksgiving toast to a defense of your industry before a hostile audience.

Arranged alphabetically, *American Speaker* is easy to navigate, highly entertaining and loaded with good ideas. In the calendars section, for instance, Bakshian compiles thousands of speech pegs for every day of the year in four calendars: celebrity birthdays, famous people of the past, today in history and the months at a glance. "Every audience gathered to share a com-

mon interest or celebrate a specific occasion has a built-in common bond," Bakshian writes. "A good speaker doesn't just know this; a good speaker takes advantage of it." He demonstrates how a shared reference can warm up the audience, draw a favorable analogy or build a bridge from past to present.

What about actual speeches? They're all over *American Speaker*. A section on acceptance speeches includes as an example Winston Churchill's masterful appearance before Parliament in 1954, on the occasion of his 80th birthday. To illustrate the business address, Bakshian quotes nine speeches that used humor and anecdotes to deliver serious messages to several very different audiences. In the Education section, Bakshian shows how cartoonist Garry Trudeau hilariously defused the "political correctness" time bomb in speaking to a graduating class at Yale University. And so on.

But here's what really makes *American Speaker* stand out from the crowd of business publications. In addition to the basic 600-page volume, readers also receive timely updates, transcripts of recent, powerful speeches and a free consulting service with Bakshian, to resolve those last-minute speaking challenges. Best of all, the entire package is guaranteed. Review *American Speaker* for 30 days. If it doesn't meet your expectations, return it to Georgetown Publishing House for a complete refund.

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MIT Reporter

KEEPING THE LIGHTS ON, MARKET STYLE

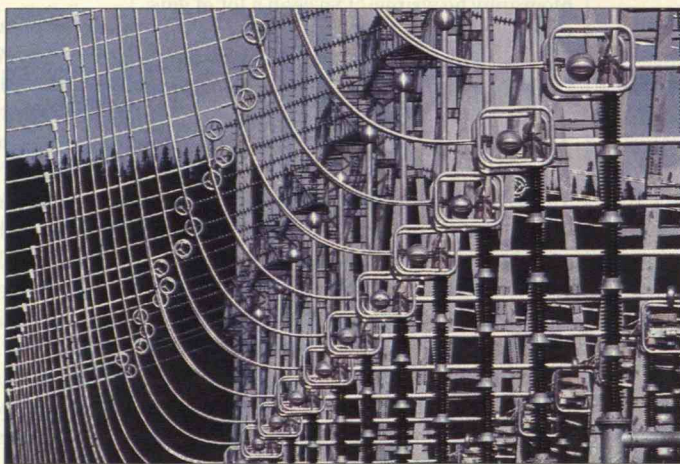


As the electric power industry faces a radical overhaul, MIT researchers are investigating what could be called the Humpty-Dumpty dilemma: how best to break up the \$600 billion business without leaving a scrambled mess behind.

The issues are both technological and institutional. The elaborate electricity grid must first operate under the laws of physics, not just according to the invisible hand of Adam Smith. Energy flowing through the wires must be kept constantly in balance; even momentary fluctuations in frequency or voltage can damage machinery or cause the system to suddenly crash.

Then there's the related challenge of forming a truly open market in a system that seems to require some form of central coordination and operation. For example, can various competitive players—independent power producers, large industrial customers, and private or publicly owned power companies—strike pricing deals with one another while still functioning under a central administrative mechanism that operates the regional power grid? Will the lights stay on during this economic free-for-all?

The questions are no longer theoretical. Traditional utility monopolies are crumbling. Independent generators now produce some 50,000 megawatts of electricity—7 percent of the national total and climbing. A 1992 federal law gave all wholesale electricity generators the right to sell across other companies' transmission lines. Large-scale "wholesale wheeling"—as the sale of bulk power over the transmission grid is called—is expanding rapidly, particularly on the West Coast. Meanwhile, electricity marketers are building a growing business by buying and selling power. If this trend continues, by the



middle of 1996 the largest wholesaler of electricity will be a power marketer, not an electric utility, according to Richard Tabors, a senior engineer in MIT's Laboratory for Electromagnetic and Electronic Systems.

So far the wheeling and dealing has been limited mainly to wholesale transactions. The companies trading electric power, for example, are usually required by law to sell only to electric utilities—not to the final customers. But competition is coming to the retail level as well. In California, utility regulators are pushing changes that would allow any large retail customer to buy electric-

ity directly from any generating company, marketer, or broker (an entity that assembles deals between various players). Similarly, regulators in several New England states, including Massachusetts, have ordered utilities to submit restructuring plans that would give customers more choice in the electricity market.

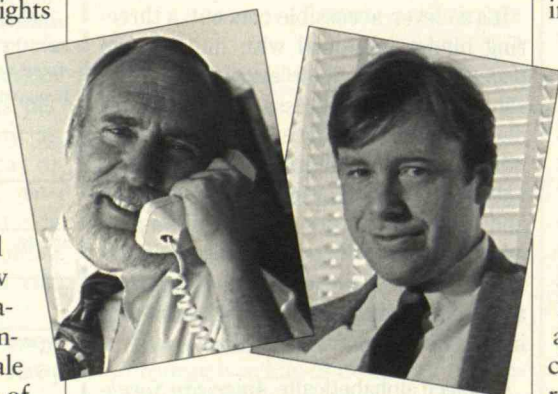
Driving the push for more competition is the often glaring discrepancy between today's marginal cost of power—what it costs to pro-

duce the next unit of electricity—and the price utilities in many regions are charging to cover the money they have sunk into expensive power projects. "Some of these utilities charge 8 to 12 cents a kilowatt hour for the privilege of getting the stuff out of the wall, even though the marginal cost is 2 cents," says Tabors. "There are huge price differences out there," he notes, especially now that many utilities are switching to smaller, more efficient gas turbines. "The large industrial customers are saying, 'Out in the real world of competition, I should be able to buy power for 2 cents a kilowatt hour.'"

Tabors has been an influential thinker in the electricity market for years. A decade ago, he and his late colleague

Fred C. Schweppe developed a technique called "spot pricing" in which prices are revised at least once every hour according to the system's marginal cost. The spot-pricing system was widely adopted. These days, Tabors, who is also a partner in a Cambridge-based consulting firm, is advising government utility regulators and business clients on the market changes that will bring about more robust competition.

Tabors advocates a model for electricity sales in which many players—generators, municipal utilities, and others—could strike competitive, independent deals. Under the present, noncompetitive system, states give power com-



Whither electric power? Richard Tabors (above left) envisions a bustling marketplace where consumers buy their electricity from the lowest bidder. Stephen R. Connors would let customers choose among high-efficiency, low-pollution, and other energy sources.

panies exclusive franchise regions. Customers, including households and factories, are captives of the utility that serves their town or region. So even though a neighboring power company could have much cheaper rates, the customer is barred from buying power directly from the lower-cost company. But Tabors is pushing regulators to allow consumers, including groups of residential customers, to exercise market clout and bring about lower prices through vigorous trading.

Tabors envisions a robust resale market. Intermediaries that he calls energy "aggregators" would actively solicit customer groups, package their electric demand together, then shop around for the best deal, just as independent long-distance telephone companies lump together and resell services purchased from

AT&T. An aggregator could combine the demand of businesses with similar needs—say, all the 24-hour convenience stores in a metropolitan area—and then assemble a deal with a seller or reseller of power. The aggregator would pay for transmission and include that service in the bill to the customer, Tabors says.

Most experts believe that the transmission grid itself—the wires and poles—should remain under the control of a single regional entity. Under Tabors's model, an "independent system operator" would manage the transmission grid. An ISO, as it is called, could cover a region—like New England, or northern California and Oregon—or an entire state. The ISO would lease or own the transmission grid and would be subject to federal regulation. It would also be responsible for keeping the power net-

work in balance, making sure energy reserves are adequate and electrical frequency is properly controlled.

Electric Mutual Funds

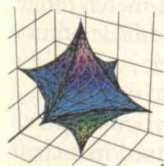
While Tabors is dealing with the economic structure of a deregulated market for electric power, Stephen R. Connors, director of the electric utility program at MIT's Energy Laboratory, is looking for ways to encourage such a system to promote technological improvements, energy conservation, and renewable energy options.

Connors says customers need more than access to a competitive market—they also need to be able to exercise choice about the energy resources that produce the electricity. "Say I want to pay a small premium and get cleaner energy.

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* Wester, M., *Computer Algebra Netherlands*, Dec. 1994. Or see ftp.math.unm.edu/pub/cas/Paper.ps. Scores of ± 1 , 0 mean correct / incorrect and no answer.



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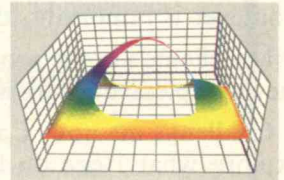
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If I have access and not choice, I can't buy natural gas or hydro or renewables. I can buy only what's there. At the same time I can't signal to the market what I want to buy. There's no dynamic built into the system that says build cleaner stuff, or build more efficient stuff."

Connors foresees a restructured utility industry in which companies package a variety of energy options and utility regulators act much like today's Securities and Exchange Commission. Instead of overseeing stock offerings, the regulators would focus on electric service portfolios. Similar to mutual funds, these portfolios could be packaged and priced according to power mix. A "clean" energy offering, for example, might be attractive to a large factory wanting to meet its air pollution allowances under the Clean Air Act.

This model meshes well with Tabors's proposed system of power trading, Connors says: "The participants in the industry are the resource providers, the power system itself, the customers, and everybody else, all striking deals."

—JOHN DILLON

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A NEVER-ENDING STORY



Joseph M. Jacobson's work may someday prove a headache for the parents of sneaky kids who prefer thrillers to the textbooks they're supposed to plow through for school assignments. On the lighter side, it could mean transporting just one volume instead of lugging dozens of boxes of books during household moves. Jacobson, an instructor at the MIT Media Laboratory, is developing a computer that will appear to be a book, complete with real pages, but whose text can be rapidly changed, countless times. Who needs those collections of traditional books when you can read whatever you want, at any time, between just two covers?

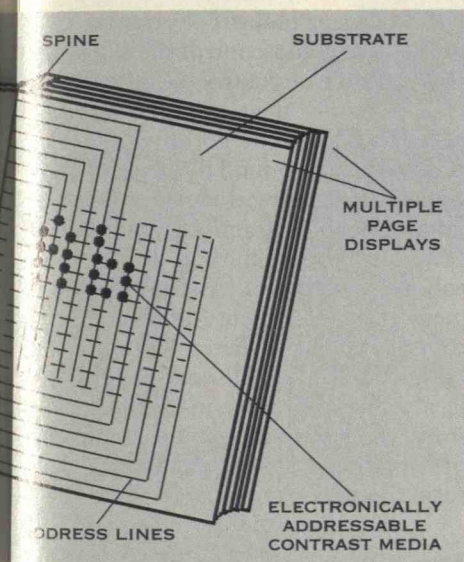
Jacobson, who recently finished three years of postdoctoral research at Stan-

To create pages of a reprogrammable electronic book, a "display driver" bidden in the spine could send positive or negative voltages to thousands of "addressable contrast media"—points—on an electronic grid. The points receiving the negative voltage would, say, show up as black and form text, while white points would not stand out from the paper substrate.

ford University in theoretical physics but has designed electronic displays for fun since he was a high-school senior, says his motivation for the project stems from the "natural" ways we use books, which clearly win out over computers for reading long works. But he has perceived a limit in the old-fashioned volume: its reader, he notes, gets "only one book's worth in a book." Wouldn't it be nice to use the same hardware—the pages—repeatedly, to read different text?

Thus Jacobson has come up with the notion of an electronic book: his project aims to construct 200 extremely thin and flexible display panels atop one another in a page-like fashion, all of them controlled by a device known as a display driver hidden in the volume's spine. This microprocessor could direct changes throughout the text if each of the "pages" were outfitted with an electronic grid and thousands of pixels. In turn, each pixel could contain numerous spherical particles in the millionth-of-a-meter range. These would be colored black on one side and white on the other.

When the driver would send, say, a negative voltage to a particular pixel, each of its particles, encased in a clear sphere attached to the paper, would turn its black side up. By sending a positive voltage, the driver would cause the particles to show their white sides, which



would not read against the paper's white background as print. A designated collection of such pixels would then appear as, say, the letter "a." Numerous such operations would produce full text.

During the first half year of the project, Jacobson's team, which includes four undergraduate students, has created the now-you-see-'em, now-you-don't particles in a variety of sizes and has found that the smallest are best because they can rotate most quickly. Now Jacobson faces other challenges in turning his idea into reality. His group needs to devise production methods to make the particles *en masse*; create on each synthetic-paper page a transparent electronic grid; and direct the display driver to quickly deliver appropriate voltage information to each of those pages. Finally the team will have to develop the software for entering and changing text.

A Bookcase in the Spine

Jacobson foresees several technologies with which this software could mesh, including, in the spine, a battery and a memory system, such as a miniature CD that stores information for up to, say, 200 books. The user, who presumably would pay a royalty for each work, could carry the electronic volume anywhere and change the type at will. Coding

could also enable the driver to download data coming over a traditional computer—such as newspaper stories or technical information carried on the World Wide Web—when the book is connected by an appropriate interface, either wired or wireless, to the other machine.

Jacobson also foresees developing a stylus that could be used to drag images within the electronically set text to different positions. For instance, users might want to move two images of similar chemicals atop one another to see quickly how they would bond. And he notes that the electronic nature of the device might allow readers to rescale text sizes for easier reading.

The project's most fundamental challenge will be to solve several problems with which flat-panel-display researchers

have little experience, says Mark Hartney, program manager of the U.S. Defense Advanced Research Projects Agency's display-technology group. The work on flexible displays is "only very preliminary," he maintains; images created on such substrates currently have coarse resolution. And he notes that an electronic book will not be really handy everywhere—such as on the proverbial deserted island—unless it requires little battery power.

Jacobson agrees that his device can't rely on heavy batteries and other non-book-like features. He estimates that two years are needed to address the challenges of the project and transform his notion into a prototype. "If it doesn't look and feel like a book," he says, "then we have not succeeded."

—LAURA VAN DAM

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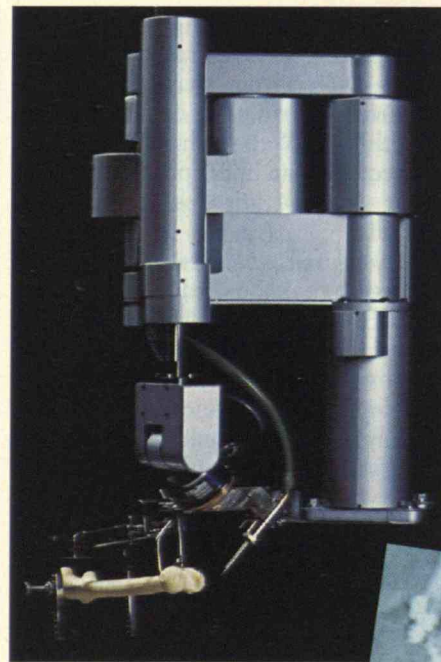
Robodoc: A Kinder, Gentler Surgeon's Assistant

■ To most observers, traditional hip-replacement operations must seem like a surgical technique straight out of the Middle Ages. Surgeons saw the ball off the top of the thigh bone that fits into the hip socket. They bang a big, heavy spike into the remaining bone to make a hole for a new ball-shaped implant. Then they hammer the implant into the hole and insert the ball into the hip socket.

The method is inexact. The thigh bone often cracks from the stress of hammering. The implant often fits so poorly in the hole that, on average, less than one-quarter of its surface comes in contact with the bone. And of the remaining area, 30 percent misses touching the bone by 1 millimeter or more, making it difficult for new bone tissue, which automatically grows after bone trauma, to attach itself to the porous titanium implant and anchor it in place. As a result, new hips usually last only 10 to 15 years, and of the 160,000 hip-replacement procedures performed each year, some 25,000 are repeats.

Now a new surgical robotic technology, dubbed "Robodoc," promises to radically alter hip-replacement surgery. Reportedly the most advanced surgical robot today, Robodoc has been used in Germany since 1994 in more than 200 hip replacements and is currently undergoing clinical trials in the United States.

Robodoc doesn't replace surgeons, says William Bargar, an orthopedic surgeon in Sacramento, Calif., who co-developed the technology, but it does help them to be more accurate. For example, of the approximately 100 hip replacements completed so far in trials at six U.S. hospitals, Robodoc has achieved 97 percent contact between implant and bone, with gaps measuring no more than 0.05 millimeters. Such gaps are no wider than hairline cracks, he says, and are thus more quickly and completely



Robodoc brings machine-tool precision to the art of hip-replacement surgery. Once a surgeon selects a given hip prosthesis, Robodoc drills the same size hole in a patient's thigh bone to ensure the optimal fit. The surgeon can monitor the process (right) on Robodoc's computer screen as the cutting tool (green) follows a programmed path (yellow).

filled in by new tissue growth.

Robodoc grew out of an unusual collaboration between Bargar and Sacramento veterinarian Howard Paul in the mid-1980s. They dreamed of creating such a machine after working with Techmedica, a company in Camarillo, Calif., that was pioneering the use of computer-aided tomography (CAT) scans to design custom implants for hip and knee replacements. "We were frustrated because we could make a high-tech prosthesis using digital data to run a cutting machine," Paul says. "But we

were still using funky tools to make the hole. If we could control the outside, why couldn't we control the inside?"

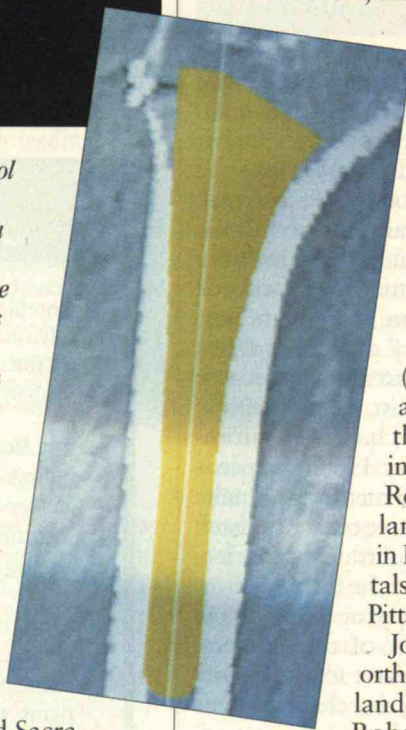
They took their idea to IBM's research division in Yorktown, N.Y., which decided to fund the research. Its engineers began working with Paul to develop Robodoc and Orthodoc, the computer program that directs the robot's movements. Assisted by biomedical engineer Brent Mittelstadt and robotics engineer Peter Kazanzides, both from IBM, Paul soon set up shop in a spare laboratory in an old, one-story wooden building at the University of California at Davis. After refining the surgical methods on plastic bones and cadavers, the three moved on to

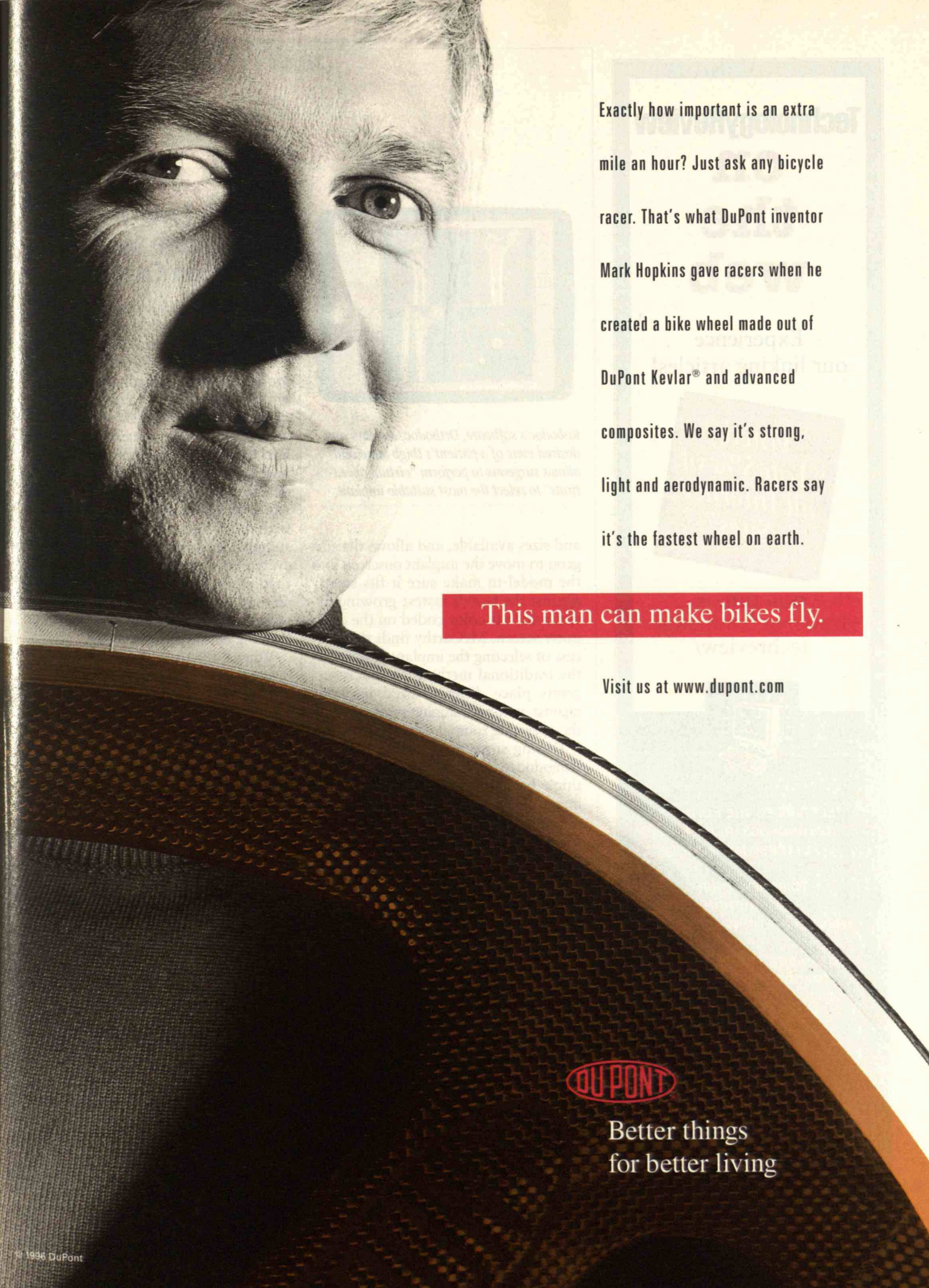
Paul's veterinary practice in Sacramento. And in 1990, Paul performed successful hip replacements on 26 dogs.

That same year IBM invested \$10 million in a company—Integrated Surgical Systems (ISS)—set up by Paul and Bargar, which then began conducting clinical trials with Robodoc at New England Baptist Hospital in Boston and at hospitals in Sacramento and Pittsburgh.

Joseph McCarthy, an orthopedist at New England Baptist who uses Robodoc as his chief assistant, begins a hip-replacement operation by surgically placing three locating pins, which will be used later by the computer as reference points, in the thigh bone of the patient. He then performs a CAT scan of the area and loads images into Orthodoc, which provides a three-dimensional view of the bone.

The program selects the appropriate-sized implant from the dozens of shapes





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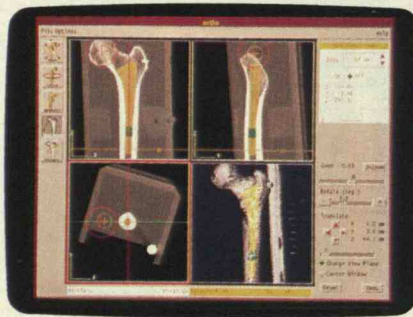
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Robodoc's software, Orthodoc, displays any desired view of a patient's thigh bone and allows surgeons to perform "virtual operations" to select the most suitable implant.

and sizes available, and allows the surgeon to move the implant onscreen into the model to make sure it fits snugly against the bone's fastest-growing tissue, which is color coded on the computer screen. McCarthy finds this process of selecting the implant superior to the traditional method, in which surgeons place different-sized implants against an x-ray hanging on the wall in the operating room.

During surgery, McCarthy orients Robodoc to the three locator pins in the thigh bone to associate it with the image of the bone on the computer screen. He then directs the robot to drill a hole for the implant and monitors its progress on the computer screen, which shows a probe slowly moving down the thigh bone. After about 15 minutes, Robodoc is finished, and McCarthy inserts the implant and taps it lightly into place.

Surgeons will have to wait to assess Robodoc's long-term effectiveness. All that can be said now, says McCarthy, is that Robodoc helps prevent cracking of the thigh bone, and undersizing, oversizing, or misaligning of the implant. Still, he and others are optimistic that by avoiding these complications and enabling the implant to be anchored more securely in place, Robodoc will significantly extend the life of prosthetic hips.

—JANE E. STEVENS

Rust: A Low-Tech Alternative to Pollution Control

Technological progress can be quite serendipitous. A case in point occurred in 1984 when Robert Gillham, a hydrologist at the University of Waterloo in Ontario, Canada, supervised a graduate student who was trying to determine if polyvinyl chloride (PVC) well casings were contributing to the level of chlorinated compounds found in polluted underground water. The student compared readings from water into which the plastic piping had been placed with those from water exposed to presumably nonreactive iron piping. To everyone's surprise, what he found was that—for reasons neither Gillham nor anyone he initially consulted understood—the iron piping was actually cleaning up the polluted water.

When Gillham finally found time to return to the work in 1989, he discovered a groundwater cleanup technology so simple that people still have a hard time believing it is true. Yet, by the end of last year, roughly a dozen commercial sites in the United States and Ireland were experimenting with the technique.

Here's how it is done: Dig a hole in the ground in front of an advancing plume of polluted groundwater. Fill in the trench with a couple hundred tons of iron filings. As the water flows through the iron, a reaction with the iron breaks down some of the nastiest industrial pollutants—including trichloromethane, tetrachloroethane, and dichloroethene—into water, hydrogen, carbon dioxide, and other nontoxic materials.

One so-called reactive wall—some 4-1/2 feet thick, 40 feet long, and 20 feet deep—is being used to destroy cancer-causing solvents at the former Intersil semiconductor manufacturing plant in Sunnyvale, Calif. Initial results have produced astounding findings. "Basically, we haven't been able to find any chlorinated solvents after the treatment," says Timothy Sivavec, a chemist at General Electric Corp., which owns the polluted site.

The chemistry of what some original doubters scoffingly called "magic sand" has now become better understood. Paul Tratnyek, a chemist at the Oregon Graduate Institute, first pointed out that the degradation reaction could be explained by chemistry that had been used in making organic compounds since the turn of the century. "If you had come to me five years ago," he says, "and asked if metals could cause degradation of other materials, I would have said, 'Yes, of course. But who cares?'" It took a nonchemist—Gillham—to examine the reaction with fresh eyes and understand its significance for environmental remediation.

and produce hydrocarbons such as methane and ethane, which are also generally harmless except in very high quantities and can easily break down into more basic compounds.

One major test of the iron wall is being conducted by the University of Waterloo at a military base near Falmouth, Mass., where seepage of solvents used to clean tanks and other armaments has created 10 plumes of polluted groundwater and forced the closure of at least one city well. Officials at the Department of Defense estimate that it would cost approximately \$250 million over a 20-year period to treat the water

of the technetium on the iron in solid form. To complete the groundwater decontamination, the radioactive iron would have to be removed from the soil and safely stored.

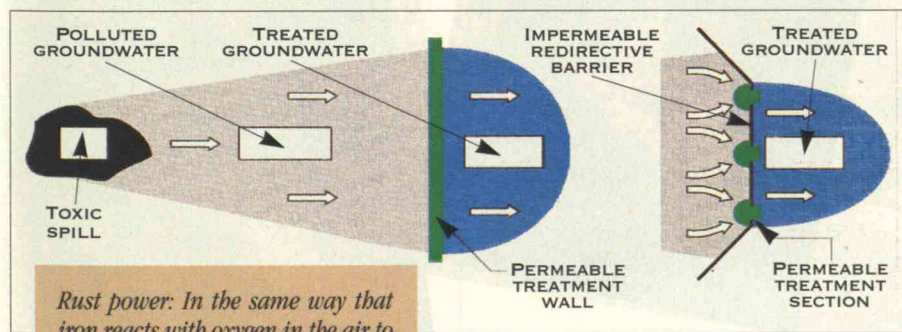
While the technology is promising, several questions remain, not the least of which is how long an iron wall will work. Gillham has tested a wall at a Canadian army base in Borden, Ontario, for four years. He reports that while the iron will eventually have to be replaced because of rusting and clogging, so far no diminution has occurred in the wall's ability to break down chlorinated solvents. Elsewhere, GE's Sivavec has engineered accelerated test-tube experiments that indicate iron will continue to break down solvents with high efficiency over a 10-year period.

Another concern is that at particularly contaminated sites, toxic byproducts of common pollutants such as trichlorethylene and perchlorethylene will leach through the iron filings before they have completely broken down. One common-sense solution here, however, may be to simply build thicker walls.

The exact shape and size of walls needed to clean up various sites also has not been precisely determined. To minimize the length of wall needed to intercept an amorphous plume of contaminated water, Envirometals is experimenting with a new design that features nonporous wings to guide polluted water toward the wall.

Though iron-wall remediation is in its infancy, researchers voice optimism that the too-simple-to-be-believed technology is going to be too good to pass up. Gillham, for one, thinks the technique could potentially be used to reduce the cost of cleaning up thousands of Superfund sites in the United States, which is now estimated at hundreds of billions of dollars. Others, such as Nic Korte, head of the restoration technology group at Oak Ridge National Laboratory, are more cautious: "I am not a clairvoyant," he says, "but I certainly believe putting in a passive barrier at some sites will be both effective and last a long time."

—STEPHEN STRAUSS



Rust power: In the same way that iron reacts with oxygen in the air to create rust, iron filings can react with toxic chemicals in polluted groundwater to create harmless chlorides and hydrocarbons. While a simple trench filled with filings (above left) could intercept a small plume of contaminated water, a solid wall with wings that redirect groundwater through a few porous, iron-filled sections (right) may be more cost effective for large, amorphous plumes.

The process reflects the catalytic qualities of generally inert noble metals such as iron, copper, silver, platinum, gold, and palladium. Think of the remediation reaction Gillham discovered simply as a variation of the corrosion process that produces rust. The agent that causes iron to oxidize into the ubiquitous orange rust is simply oxygen. But other chemicals, including chlorinated solvents, can serve as corrosive agents. When these come in contact with the iron filings, they create a gray "rust" made of harmless chlorides

using conventional methods, in which water must be pumped out of the ground, treated, and pumped back in. Gillham, who has formed a small Guelph, Ontario, company called Envirometals to exploit the technology, estimates that iron walls to block the plumes would cost about \$500,000.

The iron-in-the-ground approach has inspired other research. Martin Reinhard, a chemist at Stanford University, has been experimenting with the technology to break down nitrates—fertilizer residue that often pollutes streams near farms or golf courses. Laboratory experiments indicate that iron can transform nitrates into more benign nitrogen products such as nitrogen dioxide.

Quintus Fernando, a chemist at the University of Arizona, has shown that when tiny amounts of palladium are added to the iron sand, it can remove radioactive technetium from ground water. In this case, the removal is not a decomposition process, but a deposition

Entrepreneurship with a Social Conscience

Far up in the highlands of Michoacán, west of Mexico City, a logging tractor wheels through the lumber yard of the New San Juan forestry cooperative, clutching three huge pine-tree trunks in its steel claw. In a cloud of dust and diesel exhaust, the machine bucks to a halt and, with a hydraulic whine, abruptly tips its load onto a bark-stripping machine. As the tractor backs away, a toothed roller scours the log, spraying pulverized bark and filling the air with the scent of pine. Then the bark stripper dumps the pale yellow timber onto a massive conveyor belt leading into an open-air shed.

At first glance, the sawmill looks much like any other. But on closer inspection, significant differences emerge. Inside the shed, for instance, mill employees perform much of the work by hand. Amid the howling noise and swirl of sawdust, they manually fasten the naked log to a wheeled carriage and direct it to a band saw, which carves fat slices from its sides. Workers then send these raw slabs to trimming saws, which craft finished boards. Elsewhere, employees use axes to strip bark from short logs that will be chipped for paper pulp.

Such lack of automation would be deemed uneconomical in a mill governed by strict bottom-line principles. But the forestry cooperative of New San Juan does not measure success solely by profitability—even though it has earned money annually since it opened more than a decade ago. Rather, job creation and sustainable yield rank equally high on its list of goals. And on both accounts the cooperative has fared exceptionally well, creating 850 jobs that pay at least double Mexico's minimum wage and reforesting more land every year.

The New San Juan cooperative arose as part of a "community forestry" movement that began in Latin America in the 1980s to promote indigenous economic development and environmental

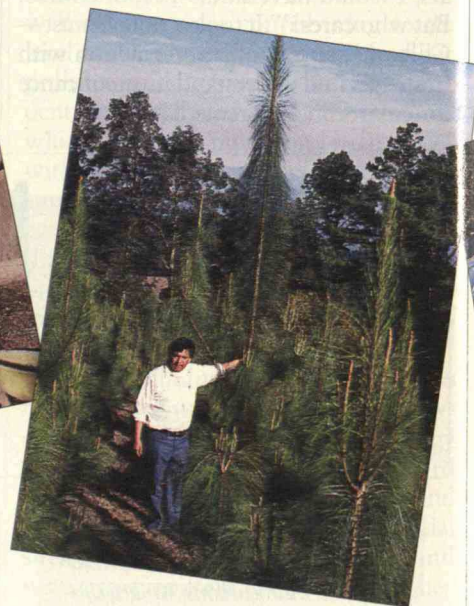
preservation. In essence, the idea was to build profitable, labor-intensive businesses that would reflect village structures and traditions and maximize long-term benefits to the community, without resorting to cut-and-run logging for short-term profits.



Intrigued by the concept, international development organizations funded initiatives in Mexico, Bolivia, Peru, Thailand, and elsewhere. But community forestry has not always met expectations. Some Latin American projects are struggling, others have shut down entirely, and early proponents are rethinking their support, according to Ted McDonald, an anthropologist with Cultural Survival, a Boston-based advocacy group for indigenous cultures. For example, he says, "the premier community project in this hemisphere," the Pumaren project in Ecuador, failed despite considerable outside support because of mismanagement and disorganization, and has sold its land to the highest bidder.

Other difficulties have been attributed to corruption, insufficient technical knowledge, poor social cohesion, and lack of government support. In some cases, says McDonald, organizations have opted for cut-and-run forestry instead of sustainable forestry.

Against this backdrop, New San Juan is welcome proof that the community forestry recipe can work—if it's followed intelligently, honestly, and inventively. "In a short period, they have achieved a holistic use of the forest resources," says Maria Angelica Sanchez, a rural sociologist with the National University of Mexico. "Technically and organizationally, it's one of the most advanced community forests."



The Purepecha Indians who own and operate the New San Juan cooperative have lived in the highlands of Michoacán for almost 500 years. Their 70 square miles of communal land occupy a plateau studded with extinct volcanoes where an annual rainfall of 51 inches supports a thick forest of pines and oaks.

In 1943, the village of San Juan made headlines around the world when a new volcano, Parícutin, began spewing lava from a cornfield. By the time the eruptions ended in 1948, molten rock had buried the old town, sparing only the spire of the stone church. At the time, the surrounding forests, which were the property of the national government, were being sold to Mexican and European firms that had no obligation to hire local people or respect the environment.

As the Purepecha settled into New San

Juan, they watched with growing resentment as the outsider firms continued to log their forests. "They took the best trees and left the worst for us," says Ambrocio Saucedo, the coop's forestry supervisor. "They cut, trashed part of the forest, and left us in poverty."

So community members resolved, as Saucedo says, "to defend the forests," and began pressuring the government to change the law to allow indigenous groups to harvest their own trees. By

divided up into tracts that are harvested on a rotating basis. Each tract, except for some 1,400 acres of protected land, is first thinned to remove crooked, crowded, or diseased trees. Most of the remaining trees that are 30 feet tall or taller are also harvested, except for a few 100-foot "father trees." These 100-foot giants are left standing to prevent soil erosion and provide shelter for the nearly 2 million seedlings raised by the coop each year.

public on 250 acres of fruit orchards.

This blend of diversification and doing-it-yourself is a trademark of New San Juan, which builds its roads, repairs its equipment, and operates its trucks. The coop also has a bus service, a community store, and an agriculture chemical business, and is even thinking about bringing tourists to an attractive wooden cabin overlooking Paricutin Volcano.

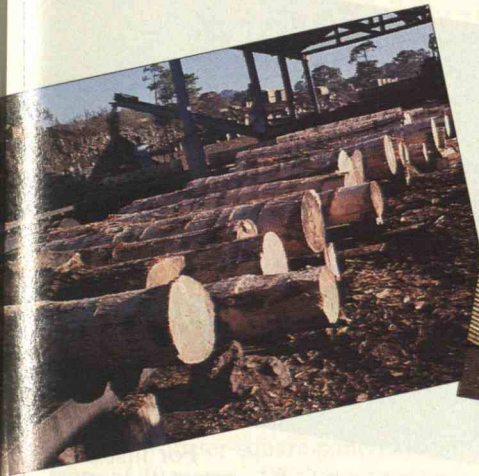
New San Juan benefits from an organizational structure that separates the elected community assembly from the forestry business. While the assembly sets goals for the forestry operation—job

creation, profit reinvestment, and reforestation—the coop is free to make decisions about hiring, harvesting, manufacturing, and marketing.

How to explain the New San Juan success? Saucedo says the community has brought an added "seriousness" to its work. Certainly in the mill, the offices, or out in the forests, you'll see an industriousness that any business, anywhere,

would envy. That dedication is also reflected in a commitment to growth, to reinvesting all profits, to finding or inventing new businesses, and to solving problems. For example, faced with an economic storm caused by the 1995 devaluation of the Mexican peso, the coop responded by cutting costs and seeking new export markets. In other words, they're acting like capitalists, with a devotion to developing the community and keeping profits at home. Call it entrepreneurship with a social conscience.

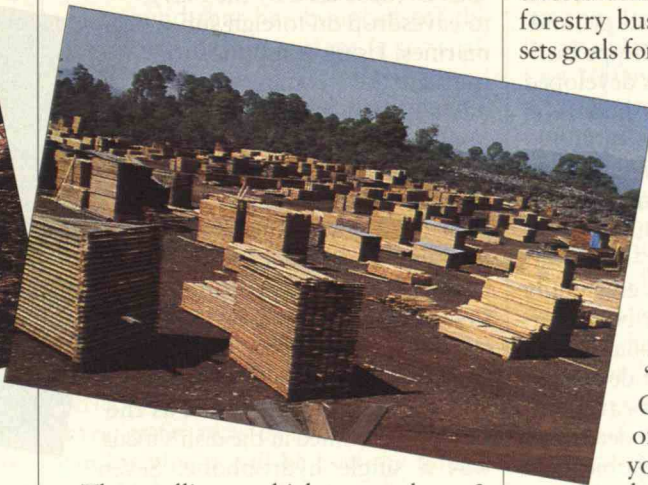
Now that New San Juan is being recognized as a leader in Mexican community forestry, the community has started putting on seminars for other Latin Americans who want to emulate their success. And given New San Juan's spirit of sharing the wealth, it's not surprising to learn that outsiders are not required to pay anything to attend except travel expenses.—DAVID TENENBAUM



Sustainability and job creation are the hallmarks of the New San Juan forestry cooperative. Tracts of the forest are managed on a rotating schedule in which seedlings are planted and allowed to grow to 30 feet before the land is cleared and replanted once again. To maximize employment opportunities, the coop has diversified operations. Besides selling lumber, members build houses and furniture, chip knotty logs for paper pulp, and distill pine resin into wax and turpentine.

1986 they were successful, and for the next two years, New San Juan joined a regional association of forestry communities. But finding the new forestry practices no better than the old ones, New San Juan struck out alone.

The coop's intensive forest management plan was devised by Saucedo, who has a degree in forestry from the University of Michoacán and who has, in turn, educated the employees in sustainable practices. Under his plan, the forest is



The seedlings, which grow about 3 feet per year in the favorable climate, are allowed to grow for about 10 years, or to about 30 feet before they are cut down. The goal is maximum output, Saucedo says, and since trees grow more slowly as they age, "it doesn't make sense to let the trees slow down."

The coop extracts as many jobs as possible from its limited forest land. Its members have replanted thousands of acres that were covered with volcanic ash from the 1943 eruption. Instead of merely milling lumber, the coop also makes hardwood furniture, molding, even prefabricated houses. It chips knotty logs for sale to a paper mill. Coop members tap the pines for resin, and haul it on mule-back to the coop's new distillery, which produces wax and turpentine and earns 28 percent of the coop's income. Aggressively pursuing business opportunities, the coop's tree nurseries have started raising peach and avocado trees and ornamentals for sale to the

Taking Pictures with Sound

As the commonly murky, close-up views of the Titanic and other undersea wonders attest, getting decent visual images in the deep sea is like photographing in fog. Seawater absorbs rays from even the brightest tropical sun at quite shallow depths, and any stirring up of sediments causes objects more than a few meters from the camera to blend unrecognizably into the background. But now a physicist at the Scripps Institution of Oceanography has developed an underwater camera that he hopes will eventually cut through the haze and produce clear color images of objects up to 100 meters away by relying not on light to form the picture but on sound.

Engineers realized long ago that sound, to which seawater is essentially transparent, would yield far better undersea detection than light. Sonar (sound navigation and ranging), first developed during World War I to locate submarines, uses sound waves to determine the distance and direction of objects in the ocean. But while sonar revolutionized undersea surveillance and exploration, it does not produce a pictorial image like a photograph and thus requires a high level of human or computer interpretation.

While working on sonar systems for the Royal Aerospace Establishment in Farnborough, England, in the mid-1980s, research physicist Michael Buckingham thought there had to be something better. "One day it dawned on me that just possibly we could use sound in the ocean the same way we use light in the atmosphere to make photographs," he recalls. By the time he joined Scripps in 1990, he was ready to start testing his idea for an underwater camera that would use natural noise in the oceans to form images of objects beneath the sea.

The notion was simple and elegant. Buckingham knew the ocean to be an orchestra, ever humming with the thrum caused by breaking waves, bubbles, spray, rain, the songs and other utter-

ances of marine mammals, and human activities such as shipping and offshore engineering. This sea of sounds offers the acoustic equivalent of daylight. So why not tap this widespread illumination, as a camera does light, to compose images, he wondered.

Buckingham proposed employing an acoustic rather than an optical lens, similar to a satellite dish, to focus sound waves reflected from objects onto hydrophones—undersea microphones—such as those used by the Navy to eavesdrop on foreign submarines. Using computers to translate the incoming sounds into digital picture elements, or pixels, should yield photographs of whatever the camera focused on, he thought.

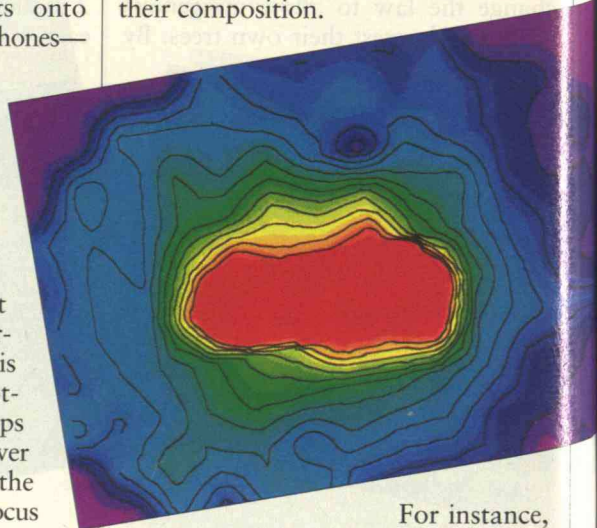
In 1992, Buckingham set out to test the idea with a basic experiment. He had divers prop up his first crude "camera" on the bottom of San Diego Bay off Scripps Pier. A parabolic reflector just over a meter in diameter served as the lens, and mounted at the dish's focus was a single hydrophone. Seven meters away, the divers erected three rectangular targets of plywood faced with neoprene, a rubber that is acoustically reflective. Buckingham aimed the camera at the targets as they were facing the dish, edge-on to the dish, or absent altogether.

His results, published in *Nature*, showed that the hydrophone, which was tuned to listen for sound waves between 5 and 50 kHz, picked up the loudest reflected sounds from the targets facing the camera, fainter sounds from the edge-on targets, and ambient noise when the targets were absent. In fact, the noise level went up by a factor of two when the targets were facing the camera versus when they were not.

The computer then created an acoustic snapshot, by assigning one color to the area from which sound was reflected most loudly and another color to wherever the reflected sound was weak or absent. The crude, one-pixel photo, says Buckingham, "was hardly the last word

in imaging, but it was really just to prove a point," namely that using ambient sound in the ocean was valid.

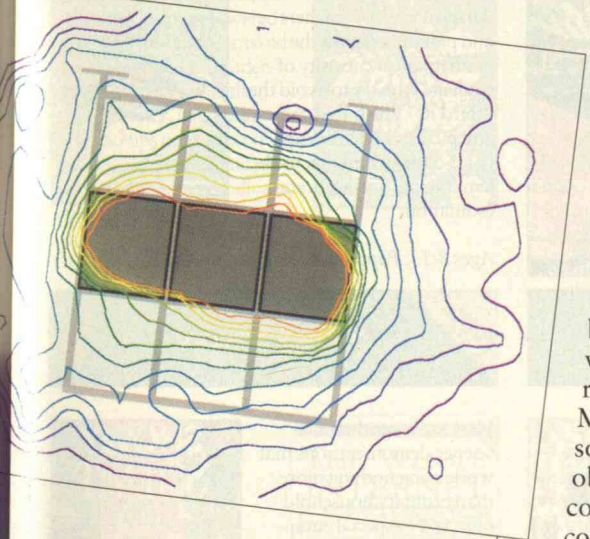
Readings from the targets facing the camera also revealed that certain frequencies—those centered around 10, 22, 33, and 47 kHz—were reflected more strongly than others. Buckingham theorized that objects reflect sound better at various frequencies depending on their composition.



For instance, solid objects might reflect higher frequency sounds best while hollow or porous objects might more readily reflect low-frequency sounds. These subtle differences could thus form the basis of "acoustic color," enabling computers to convert them into different hues, he notes, like the artificial colors added to infrared and ultraviolet satellite images.

Buoyed by this initial success, Buckingham launched into a second experiment, this one using a more sophisticated underwater camera called Adonis (acoustic daylight ocean noise imaging system). Adonis features a 3-meter-wide dish that bears 126 hydrophones, each of which corresponds to a single point source, or "beam," of sound, enabling the computer to create 126 pixels in the final image. The camera also concentrates on sounds in the 70-to-80 kHz range, which Buckingham subsequently determined provided superior resolution.

In a recent experiment, operators aimed the camera at a cruciform target



A camera that collects ambient sound waves the way film in a normal camera collects light produced these computer-enhanced images of an underwater target. While crude—the camera featured a single microphone at the focus of a small parabolic dish—a larger and more sophisticated version might someday be used to take undersea pictures in remote areas.

made of 4-meter-square panels at a distance of 40 meters. “We’ve got recognizable images of the cross,” Buckingham says. “That’s our best result to date.”

Further, Buckingham has taken the step from still to video images by panning the dish across the target and by refreshing the image on the video monitor 30 times a second. But because of the low resolution of a 126-pixel image, he says, the picture quality is far inferior to that seen on TV.

Buckingham sees several ways of sharpening the video image. First, he envisions the next generation of Adonis bearing 1,000 hydrophones, which would increase the resolution nearly eight-fold. Second, he plans to adapt image-processing techniques normally used for digital photographs to enhance the video images. Finally, by mounting the camera on a remotely operated vehicle, or ROV—his ultimate vision for his creation—it would be able to obtain better images of objects simply by getting closer to them.

Some question the long-term viability

of using acoustic daylight to form images. Nick Makris, a research physicist at the U.S. Naval Research Lab, has done studies published in the *Journal of the Acoustic Society of America* showing that decent images were possible only within the so-called “deep shadow range” behind an object underwater, which for something the size of a refrigerator is only a few meters, Makris says. Beyond that, any sound that has bounced off the object’s front surface is so weak compared with diffracted sound coming from behind, that imaging anything other than a silhouette becomes impossible just outside the shadow, and even the silhouette rapidly vanishes with increasing range.

“Imagine waves coming broadside to a tanker in the open ocean,” says Makris. “If you get on the other side of that tanker, you’re not going to feel the waves. You’re in the lee and it will be perfectly calm—that’s the shadow. Now if you go far away from that tanker, you can imagine it will be as if the tanker wasn’t there—you’ll be in the waves again.” The only way around this problem, he says, is to have a known sound source coming from the front or the side of an object that overwhelms any coming from behind—the equivalent of direct sun or side-lighting in optics.

Sharper Images

“The simple answer is we’ve done it,” says Buckingham when asked about such constraints. In his most recent experiments off Point Loma about 16 kilometers south of Scripps Pier, Buckingham says he has imaged objects as far as 80 meters away. He aimed Adonis at different objects—air-filled spheres, barrels full of sand or synthetic foam resting on the seafloor or suspended—at various ranges. “We were able to see everything we looked at without exception,” he says. When one of Buckingham’s graduate students accidentally dropped a 50-gallon PVC drum over the side of

their small boat while trying to deploy it as a target, he happened to be watching the screen and, to his surprise, actually saw an image of sediments swirling up when the barrel hit the bottom.

Why the discrepancy between his and Makris’s findings? Buckingham says that, for one, Makris and his colleagues were working at 10 kHz while he has focused on the more effective 80-kHz range. Thus, he says his own theoretical analysis—published in the *Journal of Comparative Acoustics*—reached different conclusions, namely, that it should be possible to image over a distance of at least 100 meters. He also points out that a Scripps colleague named John Potter ran numerical models of acoustic daylight imaging that further corroborate his findings. Finally, he says he has images from the ocean that prove the concept. From his most recent tests alone he claims he has 75 CD-ROMs full of imaging data. “With 30 images a second,” he notes, “it doesn’t take long to accumulate a few gigabytes.”

Why go to all the trouble of processing weak ambient images when you probably get better images by sending out an audible ping and analyzing the echo? Indeed, that’s exactly what sonar and medical ultrasound do very successfully. Buckingham responds that pinging uses up a lot of energy, which may be a factor while imaging beneath Arctic ice and in other inaccessible areas.

Further, certain applications require completely covert operation. Buckingham, whose principal funder is the Office of Naval Research, is quick to point out possible military uses for his creation, including detecting mines and watching for enemy submarines. Other possible applications include mapping the composition of the seafloor and viewing oil-rig struts for flooded members.

Finally, what about artistic applications of making photographs with sound? “Some of our images are very appealing to look at,” says Buckingham. “Maybe we’ll see acoustic daylight images hanging in the New York Museum of Modern Art.”

—PETER TYSON

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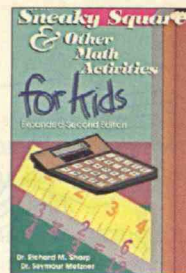


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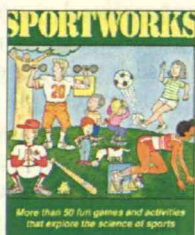


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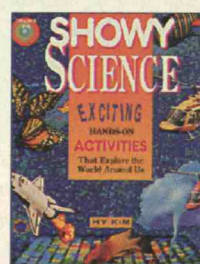


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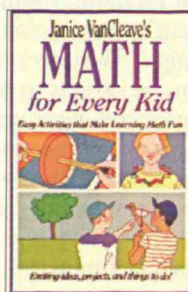


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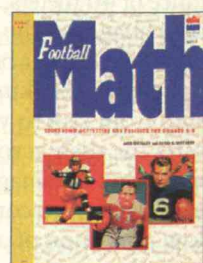


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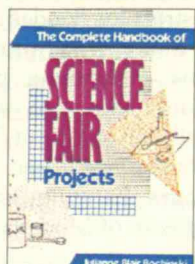


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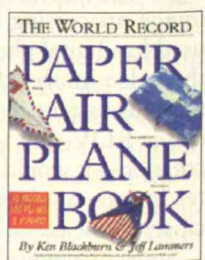


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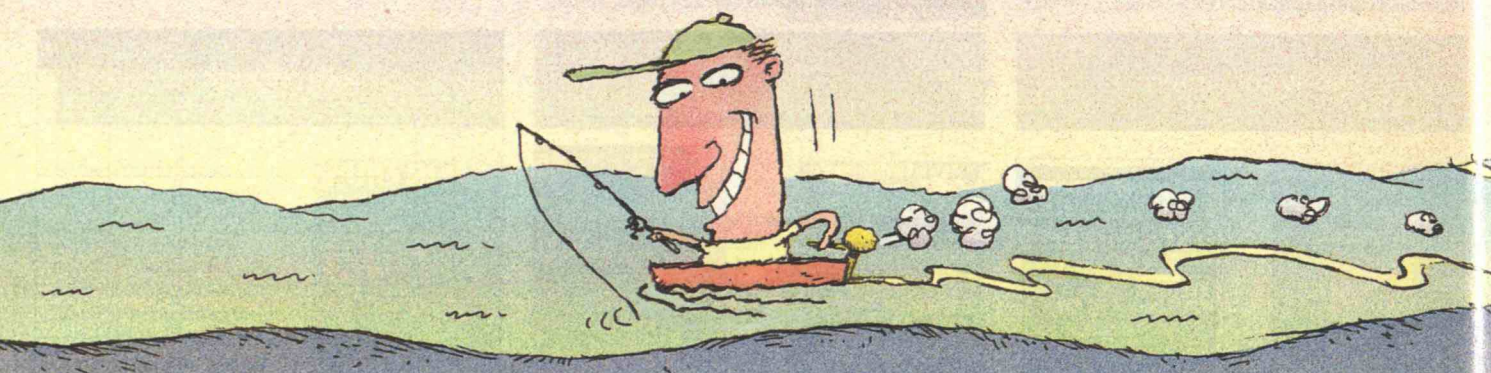
Combining the fun of making a piece of paper fly with the science of aeronautical engineering, here is an all-you-need book for beginners and experienced flyers alike. Written with soaring enthusiasm by the world-record holder Ken Blackburn, it includes: 16 different designs, 100 full-color ready to fold airplanes, plus a tear-out runway and custom flight log.



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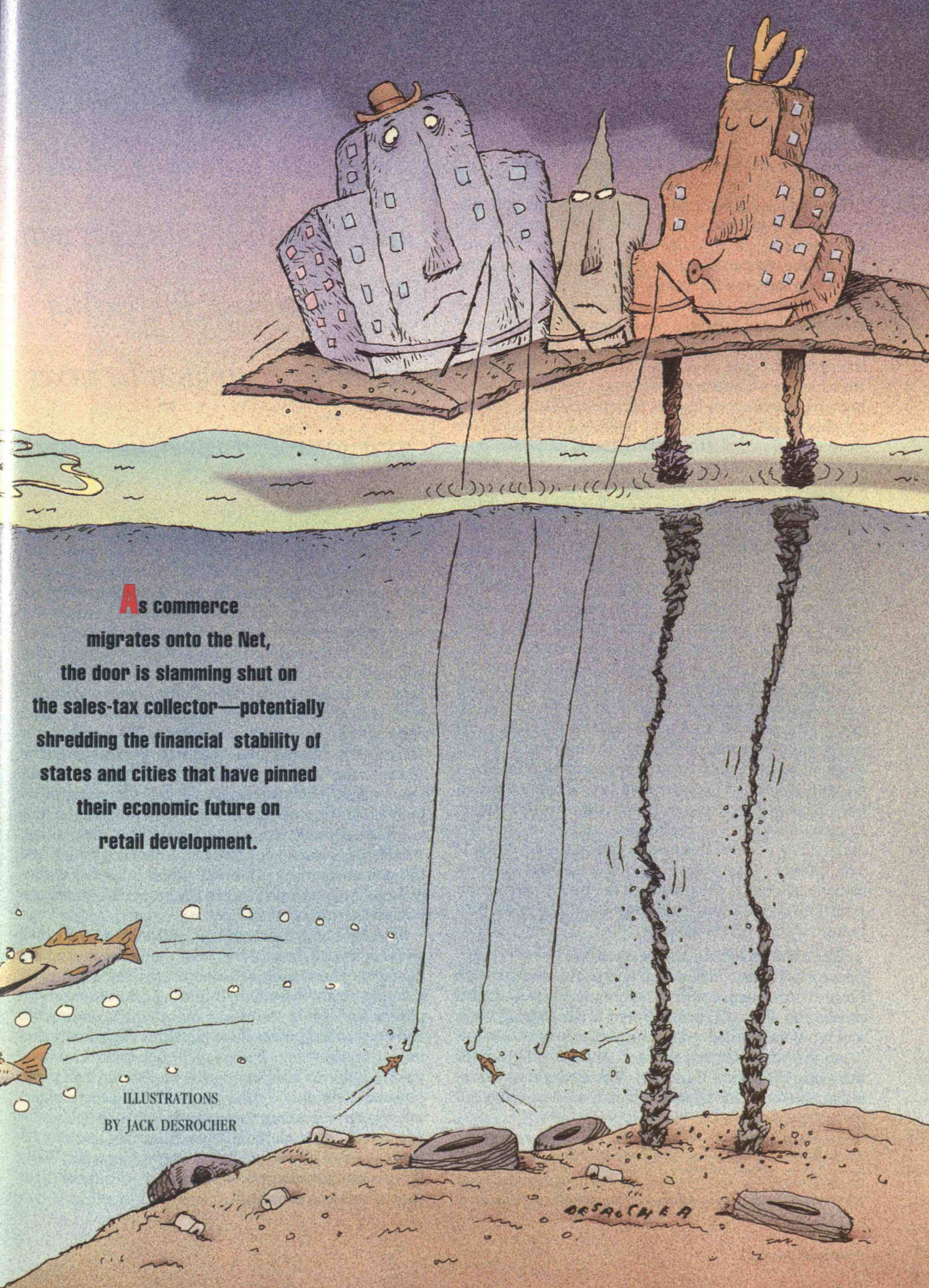
The Great Internet Tax Drain

By Nathan Newman



As Orange County goes bankrupt and cities and towns from Los Angeles to New York teeter on the edge of financial chaos, local governments crave some good financial news. This article can't deliver it. This is the story of how the Internet may deal the final body blow to the financial security of local gov-

ernments. Governments could once count on local economic development to produce local jobs where local employees would spend money in local stores, thereby generating local tax revenue for further development. This virtuous cycle has been fatally undermined by the new technology of cyberspace.



As commerce
migrates onto the Net,
the door is slamming shut on
the sales-tax collector—potentially
shredding the financial stability of
states and cities that have pinned
their economic future on
retail development.

ILLUSTRATIONS
BY JACK DESROCHER

One great promise of the Internet is that it will not only supply amusement and information but also serve as a marketplace. Advocates paint happy pictures of consumers shopping through the ultimate collection of catalogs—giving them access to a nationwide and worldwide marketplace—and ordering and paying for goods from their computers. Often overlooked is the fact that little of this buying and selling will be subject to state and local sales taxes. That's good news for the consumer—but a potential catastrophe for the state and local governments that have come to rely on sales-tax revenues.

States already lose at least \$3.3 billion each year because of retail sales that have migrated to mail-order businesses, estimates the U.S. Advisory Commission on Intergovernmental Relations (an agency that brings together representatives of state governments to improve the effect of federal policy on states). That is, roughly \$3.3 billion worth of tax revenue would have flowed to state governments if goods had been purchased in stores rather than through mail order. In 1994, California alone lost \$483 million, according to the commission, and eight other states lost more than \$100 million each.

The Internet's impact has yet to be fully felt. Total retail sales transacted on the Net added up to only about \$200 million in 1994, according to CommerceNet, a consortium of businesses exploring use of the Internet—less than one-tenth of 1 percent of what was spent on mail-order shopping. But corporate America is turning to the Internet at a dizzying pace. Companies are establishing sites on the Net at the rate of about 120 per day, according to Anthony Rutkowski, vice-president of the Internet Society, an organization that oversees standards-setting on the Net. The number of World Wide Web pages advertising businesses and products is growing at about 12 percent a month, say industry analysts. Many of these pages make it easy for Net surfers to purchase goods by typing in a credit-card number and mailing address. Businesses offering products online can “provide information 24 hours a day and not have to have people on the phone all the time to service an international market,” observes CommerceNet program manager Mark Masotto.

This trend is likely to accelerate as one of the key barriers to Net commerce—lack of security—starts to fall. Fears that hackers could intercept messages and steal passwords or credit-card numbers are becoming more and more unfounded. Last summer, Netscape Communications, which created the most popular program for browsing the World Wide Web, released software and public standards for a “secure digital envelope” that can

In an ominous collision of trends, the growth of retail activity online coincides with municipalities' increasing dependence upon sales taxes as a source of revenue.

ensure the privacy of financial data transported over the Internet. Intuit, which makes popular personal finance software, and MasterCard International are among companies announcing support for the new protocol. The floodgates of Internet commerce, it appears, are about to open.

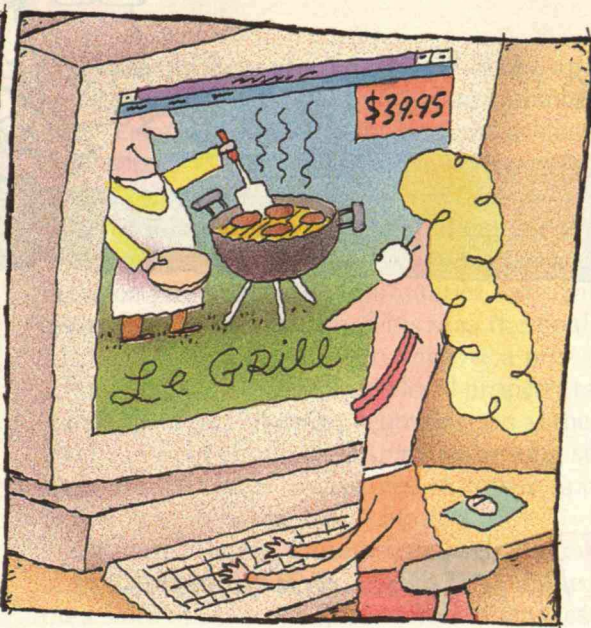
In an ominous collision of trends, this growth coincides with the emergence of sales taxes as a major revenue source for state governments. Beginning in the early 1980s, broad cutbacks in federal funding forced states to pay for more and more services out of their own budgets. With voters typically unwilling to approve higher income taxes, sales taxes often became the only politically feasible way to make up for lost federal revenues. Only Delaware, Montana, New Hampshire, and Oregon now collect no state or local sales taxes; altogether, one-quarter of all tax revenues that states collect stems from sales tax.

In many states, local governments tack on their own sales tax as well. In all, 6,000 counties, cities, and school districts collect sales tax. Ironically, the state most severely hit by the move to catalog and online shopping is California—home to many of the companies and universities that invented the technology that makes the Internet possible. Because of Proposition 13, which limits California's ability to raise money through property taxes, towns and cities are extremely dependent on sales taxes. Cupertino, for example, where Apple Computer has its headquarters, depends on sales taxes for 45 percent of all city revenues, prompting mayor Wally Dean to call the sales-tax dependence “a house of cards for government finances.”

NATHAN NEWMAN, a sociologist studying the impact of information technology on regional economies, is codirector of the Center for Community Economic Research at the University of California at Berkeley. His e-mail address is newman@garnet.berkeley.edu.



THEN



NOW

DISTORTED DEVELOPMENT

Right now, local governments that rely heavily on sales tax naturally have an incentive to encourage large retailers to move within their borders by granting them large subsidies—typically in the form of property-tax exemptions. But the competition for retail has distorted economic development. The retail establishments that a city or town recruits have tended to succumb to competition from the next wave. First, shopping in urban centers gave way to retail in the suburban towns. Then, those suburban concentrations of stores began to weaken in the face of competition from malls. Now, general purpose department stores in malls are losing out to discount “big box” retailers such as Home Depot and Toys R Us. Cities are vying against one another to attract discount giants that suck in business from a whole region, often devastating the more dispersed retail establishments that local governments, especially in the West, depend on for financing their budgets.

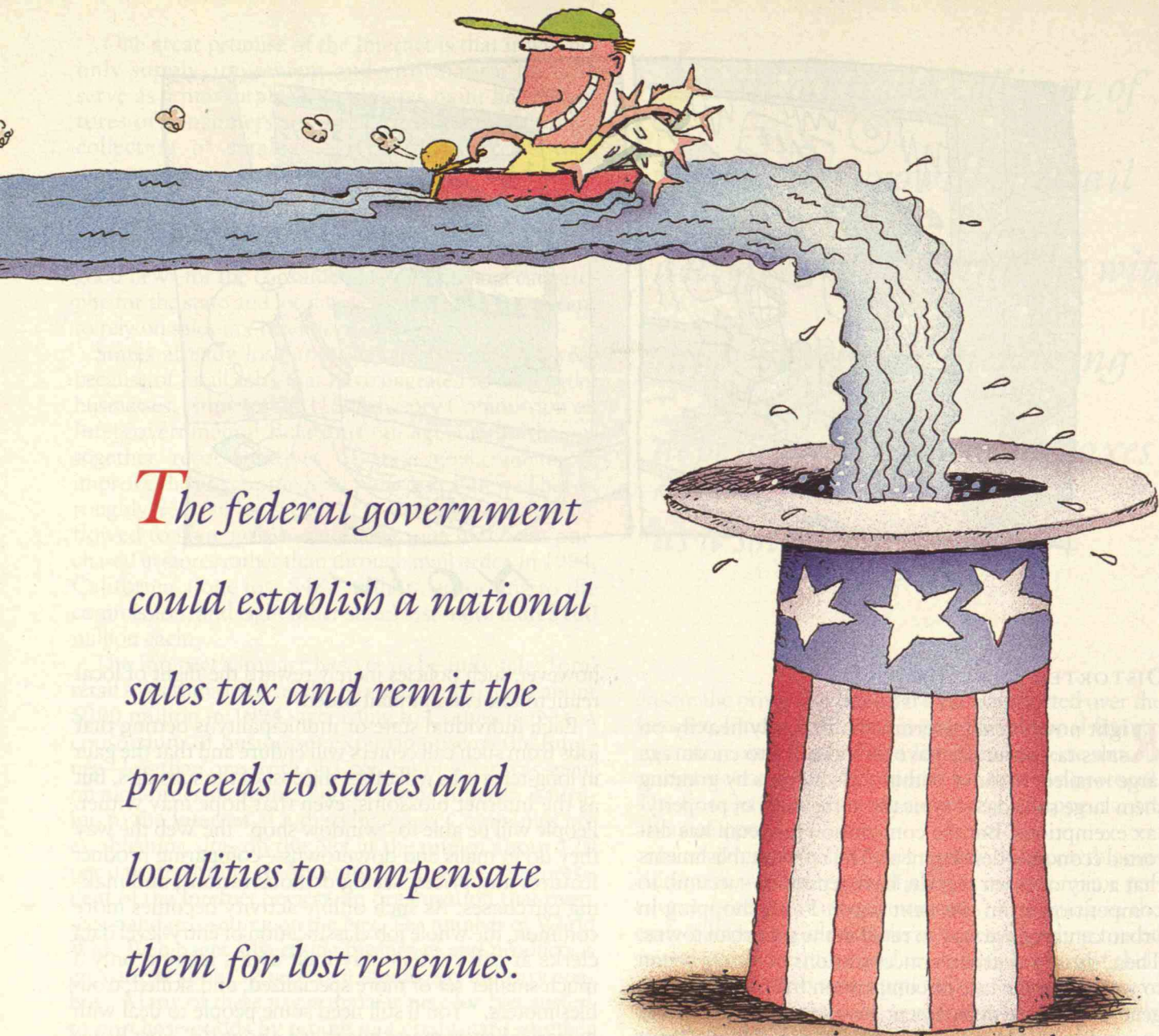
Direct marketing through telephone or the Internet takes this economic cannibalism to a new level. Cities and states are competing with a vengeance to attract order-processing “call centers” to service direct marketing companies. Oklahoma, for example, has worked hard to replace disappearing oil-patch jobs with the data entry, computer programming, and accounting employment that these call centers provide. The state excuses direct marketing companies from having to pay sales tax on 800 numbers, WATS, and private-line service—the essential tools of the mail-order trade—and grants data-processing firms that move to the state a five-year exemption from property taxes. In the end,

however, such policies merely reward the flight of local retail to tax-exempt mail order.

Each individual state or municipality is betting that jobs from such call centers will endure and that the gain in long-term jobs will offset the cost of the subsidies. But as the Internet blossoms, even that hope may wither. People will be able to “window shop” the Web the way they do in malls and downtowns—comparing product features and prices, seeing demonstrations, and making purchases. As such online activity becomes more common, the whole job classification of entry-level data clerks at call centers may melt away, leaving only a much smaller set of more specialized, and skilled, troubleshooters. “You’ll still need some people to deal with hysterical customers, but that’s about it,” says Bruce Lowenthal, Tandem Corporation’s program manager for electronic commerce over the Internet.

A CONSTITUTIONAL BARRIER

There is one obvious response to this problem: allow states to tax mail-order and Internet sales. But the courts have said no. The U.S. Supreme Court, in its 1967 *National Bell Hess, Inc. v. Department of Revenue* decision, prohibited states from taxing out-of-state sales. The court based its ruling on the Constitution’s so-called “commerce clause,” which restricts the federal government’s power over commerce between states and that prevents states from imposing tariffs on one another. In *National Bell Hess*, the court ruled that allowing a state to tax a company located in another state would violate the principle that there should be uniformity in the rules of commerce for com-



The federal government could establish a national sales tax and remit the proceeds to states and localities to compensate them for lost revenues.

panies crossing state lines.

The court reaffirmed this principle in its 1992 *Quill Corp. v. North Dakota* decision, in this case defining “in-state” sales extremely narrowly. The court held that for a state to collect taxes on sales, the vendor must have significant sales operations—such as personnel, inventory, or showrooms—within the state. If no such “nexus” exists between the seller and the state in which the purchase originates, then the transaction must be regarded as interstate commerce and is thus constitutionally out of reach of a state sales tax. Already, direct marketing companies have used toll-free numbers, computers, and faxes to dispense with the need to place operations within a sales-tax-collecting state. As World Wide Web pages begin to eclipse printed catalogs, the

physical connection between mail-order retailers and states trying to tax them will recede even farther.

The company at the center of the 1992 decision exemplifies the problem for states. Quill sells more than 9,500 different office products ranging from paper clips to computers; annual sales in excess of \$340 million in 1992 make it the nation’s third largest mail-order company, trailing only L.L. Bean and Land’s End. About half of the more than 200,000 orders that Quill receives monthly come in by telephone. The other half, however, arrive by mail, fax, telex, or computer network. To expand its business, Quill leased computer software that gives customers direct access to Quill’s computer for direct orders. The Internet will make these kinds of transactions far easier.

CUTTING LOSSES

In the *Quill* case, the Supreme Court did leave one option. While no individual state is allowed to unilaterally impose an out-of-state sales tax, the federal government may establish what would amount to a national sales tax—and remit the proceeds to the states in which the purchaser resides. In 1994, Sen. Dale Bumpers (D-Ark.) introduced legislation—the Tax Fairness for Main Street Business Act—that would have established such a tax, but the bill foundered on opposition from the Direct Marketing Association and allied business and consumer groups. These organizations contended that forcing mail-order companies to collect sales taxes would create an unbearable administrative burden; the complexity of tracking tax rates in all the states and local municipalities around the country that charge sales tax would overwhelm most businesses.

Another way that states might tap into the mail-order and online-sales revenue stream would be to levy a fee directly on consumers for the use of any retail channel that bypassed the sales tax. Present court rulings make this constitutional; while states cannot tax companies located in other states, they have full power to tax people located in their own states, regardless of where they buy their goods.

Such a “use tax” would be difficult to collect, however. If compliance were made voluntary, individuals would have to account for their purchases much as they now account for their income in filing their income tax returns—requiring a horrendous amount of bookkeeping that few people would be likely to perform with any degree of accuracy. Alternatively, states could audit individual citizens’ purchasing activities by collecting information directly from individual credit-card and checking account records. So far no state has dared to enact such a tax, but legislators may move in this direction if their sales-tax revenues continue to fall. Some states, like California, have in their constitutions strong privacy guarantees that prohibit such actions. But in other places, we may have the specter of Big Brother looking over our shoulders to collect on mail-order purchases.

The Republican majority in Congress is seeking to shift responsibilities from the federal government to state and local levels. They liken the huge federal government to yesterday’s mainframe computers—awkward and obsolete. State and local governments, by extension, are analogous to the nimble microchips and personal computers that have achieved supremacy in the information age.

But this metaphor misrepresents the situation. In reality, new information technologies call for more centralized revenue collection, not less. Since so much commerce is national and even international in scope, state

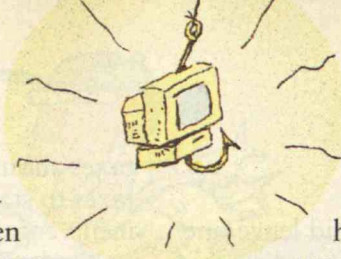
taxes should be preferred to local taxes, and federal taxes to state taxes. Otherwise, state and local governments engage in a “race to the bottom” as they cut back on services for their citizens to pay for wasteful tax subsidies. Centralized revenue collection—while admittedly running counter to the political winds favoring “devolution”—also can help erase disparities in services between poor and rich communities, especially in the area of public education. This was the goal that led Michigan’s voters in 1994 to approve a new system of school financing that replaced local property taxes with statewide taxes. Likewise, centralization at the national level can help eliminate disparities among states and thus reduce states’ incentives to lower taxes as an inducement to business relocation.

Ultimately, states should scale back and even eliminate sales taxes as a revenue source. Continued reliance on a sales tax leaves a government’s finances vulnerable to the powerful trend in retail toward mail order and, in the coming decade, Internet-based shopping that crosses state lines. In this environment, a sales tax is the worst economic policy possible for a state, as it gives an economic edge to out-of-state businesses.

Indeed, in the game of mail order, a state’s population works against it. Since companies are required to collect sales tax from in-state customers, mail-order companies are drawn to locate in states with small populations. That way, these companies can maximize the number of people that it can market to on a sales-tax-free basis. As retail establishments go online, therefore, they will tend to flee large states such as California.

The best way to make up for the revenue lost by lowered sales taxes would be through a state income tax. One benefit would be progressivity: the average state income tax rate for a family of four is only 0.7 percent of income for the poorest 20 percent of residents and 4.6 percent of the income of the richest 1 percent. (Property taxes are usually little more progressive than sales taxes.) Moreover, income taxes apply no matter how the money is spent, and so are not undermined by increases in online and mail-order shopping. An even better option is to use federal income taxes to substitute for lost revenue at both the local and state level. Although not politically likely right now, this option seems only fair—it was federal cutbacks in aid to states that led states to rely so heavily on sales taxes to begin with.

Fortunately, eliminating state sales taxes would not necessarily require much of any new revenue—if governments would stop squandering money to lure companies to relocate within their borders. Officials all over the country are in a cutthroat scramble to attract high-tech businesses to their locales, hoping to replace tax bases decimated by the decline of manufacturing employment. While some new jobs may appear, state



and local governments may see little gain in revenue if trends continue toward untaxable out-of-state and online sales. "Even though it is rational for individual states to compete for specific businesses, the overall economy is worse off for their efforts," wrote Arthur Rolnick and Melvin Burstein last March in *The Region*, a magazine published by the Federal Reserve Bank of Minneapolis. (Rolnick is senior vice-president and director of research at the Fed in Minneapolis; Burstein is that bank's executive vice-president and general counsel.) At least six states, two cities, and Puerto Rico, they note, have begun to prohibit the use of tax subsidies to recruit retailers.

The federal government has contributed to wasteful relocation subsidies. Its biggest job-subsidies programs—including industrial revenue bonds, the Department of Housing and Urban Development's community development block grants, and most Department of Commerce programs—not only permit but encourage local governments to apply the federal money they receive toward incentives to draw companies from elsewhere. The federal government could end such job piracy quickly if it mandated that any state that engages in interstate job-raiding would lose its federal funding.

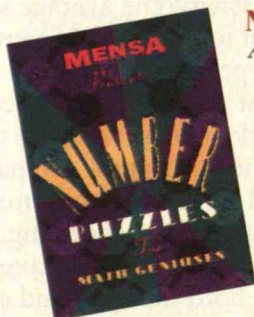
The loss of local sales taxes owing to mail-order and

online commerce should be treated as an opportunity to look more closely at how technology is changing the burdens we put on local and state governments. We

should question whether such burdens make sense in a world where multinational corporations often out-power whole states in total assets and can pit such local governments against each other in competition for jobs and local revenue. While much information-age rhetoric harkens to images of small firms and decentralization, the reality is of soon-to-be trillion-dollar corporations straddling the globe. Even modest-sized enterprises operate more and more on a global basis. Faced with such a disparity in power, local governments can hardly be expected to devise fair and efficient systems of taxation or make informed economic development decisions. The rise of national and global commerce calls for national and even global solutions, regulations, and revenue sources.

We must recognize that while the microchip may be getting smaller, the plane of economic activity encouraged by this technology is national and global. The growing fragility of the basis for state and local sales taxes should make us aware of the need for government to operate more strongly on the national and global level. ●

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ALS—IRON NEODYMIUM
BORIDE—APPEARS TO
DEFY GRAVITY IN THIS
INVERTED VIEW OF THE
SUBSTANCE POURING
FROM A PERSON'S HAND.

MAGNETS ON THE RISE

BY JAMES D. LIVINGSTON

THE MAGNET FLOATS, IN MIDAIR, ABOVE A BLACK CERAMIC DISC

IMMERSED IN LIQUID NITROGEN. THE CERAMIC IS A SUPERCONDUCTOR, AND THE CUR-

RENTS THAT FLOW WITHOUT RESISTANCE IN ITS SURFACE, INDUCED BY THE INTENSE

FIELD FROM THE MAGNET, PROVIDE A REPULSIVE, LEVITATING FORCE. FOR EIGHT YEARS

NOW, I'VE BEEN SHOWING MY STUDENTS AT MIT THIS DEMONSTRATION, WHICH USES

TWO RECENTLY DISCOVERED MATERIALS. * THE BLACK CERAMIC IS YTTRIUM BAR-

MIUM COPPER OXIDE, WHICH WAS ANNOUNCED AMIDST MUCH FANFARE IN 1987. IT WAS

THE FIRST MATERIAL TO REMAIN SUPERCONDUCTING AT THE "HIGH" TEMPERATURE OF

MINUS 196 DEGREES CELSIUS—77 DEGREES ABOVE ABSOLUTE ZERO. HIGH-TEMPERA-

TURE SUPERCONDUCTORS RECEIVED INTENSE MEDIA COVERAGE AND GENER-

*The movers and shakers of modern technology,
magnets attract little notice. But a quiet revolution is under way,
with new materials providing greater magnetic potency
in smaller packages.*

WHILE THEY

HAVE RECEIVED

MUCH LESS ATTEN-

TION AND RESEARCH

FUNDING THAN

SUPERCONDUCTORS,

NEO MAGNETS HAVE

FOUND FAR WIDER

APPLICATION.

ous research funding; the U.S. government alone has invested over \$1 billion in research on these new materials.

The levitating magnet is iron neodymium boride. "Neo" magnets such as this one, discovered independently by Sumitomo and General Motors in 1983, have received comparatively little attention from the press and government funding agencies. Yet they already can boast hundreds of important applications, while the new superconductors have spawned few. Indeed, high-temperature superconductors are unlikely ever to become as important to technology as the neo magnets.

Except for those low-tech devices pinning notes to our refrigerator, the multitude of magnets that enhance our daily lives remain hidden—out of sight, out of mind. Yet magnets are ubiquitous: they provide the steady magnetic fields that exert force on current-carrying wires to make electric motors spin and loudspeakers blare. Magnets are thus literally the movers and shakers of modern technology. And neo magnets are more and more often doing the moving and shaking. When used in conjunction with magnetically sensitive electrical elements, these magnets make possible a variety of systems for monitoring position, velocity, torque, and other aspects of automotive, aircraft, and industrial control systems. A car's cruise control, for example, relies on such magnets. And by retaining a memory of the direction of a magnetizing field, tiny magnetic particles store most of the world's data—including personal information on credit and ATM cards, the latest movies on videotape, and the words of this article on my computer's hard disk.

Magnetic materials fall into two broad categories. Permanent magnets—like the refrigerator magnet—employ a "hard" magnetic material that provides a steady magnetic field. "Soft" magnetic materials, by contrast, produce no field of their

own until acted upon by the field from a current-carrying coil or a permanent magnet. The steel of a refrigerator door is an example of a soft magnetic material. The steel becomes locally magnetized by the field from the permanent magnet, but this magnetization disappears once the permanent magnet is removed. (The terms hard and soft derive from a historical correlation between mechanical hardness and magnetic properties that no longer necessarily pertains; many of today's soft magnetic materials are mechanically hard.)

Soft magnetic materials are used as the core of electromagnets; such materials amplify by factors of many thousands the magnetic fields produced by current-carrying wires (see "On the Soft Side," page 39). But it is the new hard magnetic materials—the neo magnets—that have most strongly influenced modern technology.

IN A SPIN

All magnetism arises from the movement of electrical charge. In an electromagnet, a coil of electric-current-carrying wire induces a field that runs along the axis of the coil. A permanent magnet, too, derives its effect from the movement of electric charge—not from a current-carrying wire but rather from the spin of the electrons in the material.

In most materials, electrons are paired off with other electrons with opposite spins and so the net magnetism of each atom is zero. Some materials have atoms with a few unbalanced electron spins, making each atom a tiny magnet, but the atomic magnets point in random directions, so again no net magnetism can be detected at macroscopic scales. It is only in a few special materials—the so-called ferromagnets—that these atomic-scale magnets align and add together. We are lucky indeed that iron—the most common metal in the universe and in our planet, and one that is inexpensively obtainable from easily mined ores—is one of the few elements to be ferromagnetic at room temperature. The other two ferromagnetic elements, nickel and cobalt, have the same property but are much more expensive than iron.

In the absence of a magnetic field from

JAMES D. LIVINGSTON, formerly a materials researcher at General Electric, now teaches in MIT's Department of Materials Science and Engineering. His book *Driving Force*, published in April by Harvard University Press, covers the history, legends, uses, science, and pseudoscience of magnets.

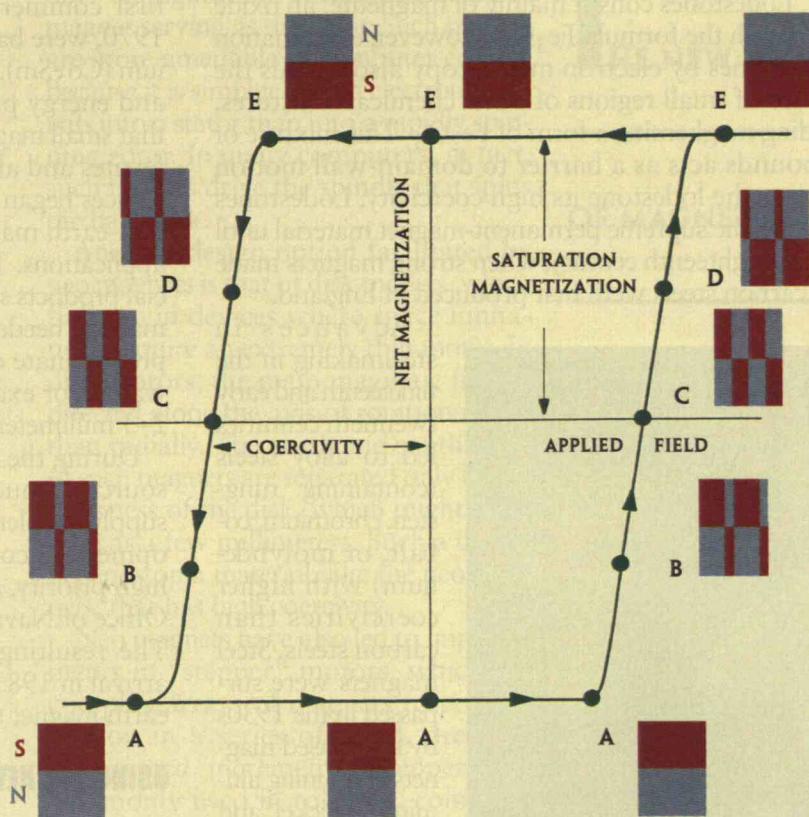
an external magnet, the atoms in a soft magnetic material—the steel of a refrigerator door, say—are divided into magnetic domains. Each domain is fully magnetized, but the direction of magnetization varies randomly from one domain to the next. Some domains have a field pointing up (“north”), others pointing down (“south”). The domains cancel each other out, and the door remains macroscopically unmagnetized.

Things change inside the refrigerator door when you attach a magnet to it. Now, each atomic magnet, like a tiny compass needle, tries to align with the applied field. This causes some domains to grow and some to shrink. If, for example, the refrigerator magnet has a south magnetic pole facing the door, the domains that grow will be those with north poles at the surface. Apply a field in the opposite direction, by attaching a magnet with a north pole facing the door, and the south-pole domains grow. As domains grow and shrink, all the action is taking place within the moving walls between domains, where the atomic magnets are flipping from one direction to another.

In a soft magnetic material, it is important that the magnetic domain walls move easily. Within the core of a power-line transformer, the magnetic domain structure must change 60 times each second, in response to alternating magnetic fields from the primary windings.

The ideal behavior for a hard magnetic material, on the other hand, is just the opposite. The utility of a permanent magnet depends on two characteristics. One is its “saturation magnetization”—roughly speaking, how strong a magnetic force it can exert. The other crucial factor is the degree of permanence. Domain walls should form and move only with great difficulty. Thus, after being magnetized in one direction, the material should require a large field in the opposite direction to move domain walls and reverse the magnetization. The size of the field that is needed to reverse a material’s magnetization is called its “coercivity.”

A quality measure that combines both the maximum



A atoms in any magnetic material are clustered into “domains,” each having a particular magnetic polarity (by convention, termed north and south). At (A), the domains all line up in the same direction. Applying an external magnetic field causes some domains of opposing polarity to form and grow (B). At (C), the north domains and south domains cancel each other out. Contin-

uing to increase the external field pushes the net magnetization in the opposite direction until saturation (E).

A magnetic material’s key properties are its saturation magnetization and its coercivity—the strength of the field that must be applied to reverse the material’s polarity. The coercivity of neo magnets is dramatically higher than that of previous materials.

magnetization and the coercivity of a material is the maximum energy product. The higher the energy product, the smaller the magnet needed for a specific application. In recent decades, materials science has produced steady increases in both the coercivity and the energy product of magnetic materials, enabling engineers to design smaller, lighter, and more efficient electromagnetic devices.

FROM LODESTONES TO NEOS

The neo magnets of the 1990s are the latest step on the ladder of improving magnetic materials that started with the only hard magnet known to Plato—the lode-

stone. Lodestones consist mainly of magnetite, an oxide of iron with the formula Fe_3O_4 . However, examination of lodestones by electron microscopy also reveals the presence of small regions of other chemical structures, including maghemite, a form of Fe_2O_3 . This mixture of compounds acts as a barrier to domain-wall motion and gives the lodestone its high coercivity. Lodestones reigned as the supreme permanent-magnet material until the early eighteenth century, when strong magnets made from carbon steels were first produced in England.

Advances in steelmaking in the nineteenth and early twentieth centuries led to alloy steels (containing tungsten, chromium, cobalt, or molybdenum) with higher coercivities than carbon steels. Steel magnets were surpassed in the 1930s by iron-based magnets containing aluminum, nickel, and cobalt—a material dubbed alnico. The 1950s brought the introduction of hard ferrites—iron oxides containing barium or strontium. Although inferior to alnicos in magnetization, the hard ferrites had higher coercivities and were much cheaper, and they rapidly dominated the permanent-magnet market. The markedly

first commercial rare-earth magnets, introduced in 1970, were based on a compound of cobalt and samarium (Co_5Sm). The unsurpassed (at the time) coercivities and energy products of this class of materials meant that small magnets could do the same job as much larger ferrites and alnicos. Applications in motors and other devices began to grow. Still, the high cost of these early rare-earth magnets limited their use mainly to military applications. They also found a niche in small commercial products such as wristwatches, where the amount of material needed was so minute that manufacturing costs predominate over raw material costs. A typical quartz watch, for example, contains a rare-earth magnet only 2–3 millimeters in diameter.

During the late 1970s, political upheavals in Zaire, source of much of the world's cobalt, led to cost and supply problems with cobalt-samarium magnets. Development of cobalt-free permanent magnets became a high priority, and the federal government, through the Office of Naval Research, began to fund such research. The resulting enhanced activity contributed to the arrival in 1983 of the neo magnet—a new kind of rare-earth magnet that uses no cobalt at all.

USING THE NEW MAGNETS

Neo magnets—based on a compound of iron, neodymium, and boron—are ten times more powerful than ferrite magnets, and more than a hundred times more powerful than the steel magnets of the last century. Not only is iron much less expensive than cobalt (the fact that motivated the research in the first place), but, fortuitously, neodymium is much more plentiful than samarium. Neo magnets have therefore rapidly replaced the earlier cobalt-samarium rare-earth magnets in many applications. Neos are also opening up new applications for permanent magnets, such as in high-power electric motors, that had previously relied upon electromagnets. The dramatic rise in coercivity and energy product has allowed substantial reduction in the size and weight of motors and speakers.

Increases in coercivity remove design constraints. Telephone receivers of the 1930s were several inches long, solely to accommodate the large and long steel horseshoe magnets inside. Why a horseshoe? Because the steel magnetic materials available at the time had low magnetization, which required the magnet to be large to provide a powerful enough field to do the job, and because the materials also suffered from low coercivity. This requires a stretched-out shape, so that most of the magnet is far from the poles and thus eludes the demagnetizing influence of the poles. A horseshoe magnet can be large and long and allows both poles to contact the item being held.

High-coercivity magnets can be short, since they can handle the self-demagnetizing effects of the poles. The



A neo magnet (above) levitates on the field created by currents in a superconductor—the other major recent advance in magnetic technology. Right: Magnetite—a form of iron oxide known as lodestone—was the magnetic material known to the ancients.



improved coercivity and energy product of alnicos and ferrites compared with traditional steel magnets led to a greatly expanded use of permanent magnets, particularly in motors and speakers.

But the most exciting advance was yet to come—the introduction in the 1970s and 1980s of rare-earth magnets. “Rare earths” is the name given the family of elements numbered 57 to 71. Although difficult to separate, some of the rare-earth metals are hardly rare; lighter rare earths like cerium, lanthanum, and neodymium are more abundant than lead or tin. The

arrival of alnico magnets allowed a much more compact design, with a receiver and speaker in a single housing. The later development of rare-earth magnets allowed the production of still smaller and lighter loudspeakers, and the generation of high-quality sound in tiny earphones. Fortunately for anyone who regularly blasts his or her ears with music from these headphones, rare-earth magnets have also led to improved hearing aids. Indeed, modern magnets, with high coercivities, are seldom horseshoe-shaped. Yet the horseshoe image of magnets persists, even though the steel magnets that took that shape became obsolete over a half-century ago. Old images die hard.

The technology on which neo magnets have probably exerted the greatest impact is that of electric motors. A motor consists, basically, of one magnet (the rotor) spinning inside another, the stator, in response to magnetic forces between them. Formerly, both magnets in most motors were iron-core electromagnets. In such a motor, a current fed into one electromagnet induces a fluctuating magnetic field that alternately pushes and pulls the rotor, making it turn on its axis.

As hard magnetic materials achieve higher energy products and coercivities, motors are better able to use permanent magnets; at a given power rating, a permanent-magnet motor can be smaller and lighter than one that uses electromagnets, and permanent magnets are more energy-efficient because they avoid the waste associated with the resistive losses of currents in an electromagnet. This trend, which began with the development of alnico and then ferrite magnets, has greatly accelerated with the advent of neo magnets, which have allowed the construction of efficient 1,000-horsepower motors that are five times lighter and smaller than traditional motors of the same power; 3,000-horsepower motors based on neo magnets are being built.

Most early permanent-magnet motors used the permanent magnet as the stator and an electromagnet as the rotor. But the reduction in size and weight, and flexibility in shape, allowed with rare-earth magnets has made feasible an "inside-

out" configuration, with the permanent magnet serving as the rotor. Such motors are more amenable to computer control because it is simpler to feed electronic signals into a stator than into a rapidly spinning rotor. In many computers, in fact, such motors drive the spindle that spins the hard disk.

Another design option facilitated by neo magnets is that of disk motors, which find use in devices where space limitations require an extremely thin motor. In disk motors, the main magnetic field is directed along the axis of rotation rather than radially. The north and south poles of such magnets are separated only by the thickness of the disk, which might be as little as a few millimeters. Such a design depends on a material, like the neo magnets, that has high coercivity.

Neo magnets have also led to improvements in "stepper" motors, which use complex arrays of magnets to provide motion in a series of small, precisely determined increments. Steppers are commonly used in robotics, computer disk drives, and printers. The precision of such a motor arises in part from how closely the magnets can be placed to one another. Neo magnets excel in such motors; the high coercivity means that magnets can be tightly packed without demagnetizing their neighbors. High coercivity also limits the extent of stray magnetic fields, an important consideration in laptop computers, where stray fields could damage the data stored on the disks.

With electric motors and actuators (motors with limited motion) replacing mechanical and hydraulic devices in many systems, the use of permanent magnets as sensors has emerged as a major market. From aircraft flight controls and industrial drives to combustion engines and antilock braking systems, sensors are required that continually monitor position or speed. This job is easily accomplished using small permanent magnets to provide magnetic fields, and coils or other electronic devices to detect those fields and deliver electrical control signals. Typically a small permanent magnet is mounted on the spinning object and an electromagnetic coil is placed close by. Every time the magnet passes the coil it

THE NEW BREED

OF MAGNETS HAS

MADE POSSIBLE THE

TINY HEADPHONES

OF PERSONAL

STEREOS AS WELL AS

THE ADVANCES IN

HEARING AIDS

THAT LISTENERS OF

LOUD MUSIC MAY

SOMEDAY NEED.

THE GREATEST
HOPE FOR DISCOVERING EVEN BETTER
MAGNETIC MATERIALS LIES IN THE VAST
NUMBER OF THREE- AND FOUR-ELEMENT
COMPOUNDS WHOSE
MAGNETIC PROPERTIES REMAIN
UNEXPLORED.

induces a brief electric current; monitoring these bursts of current yields information about rotational speed.

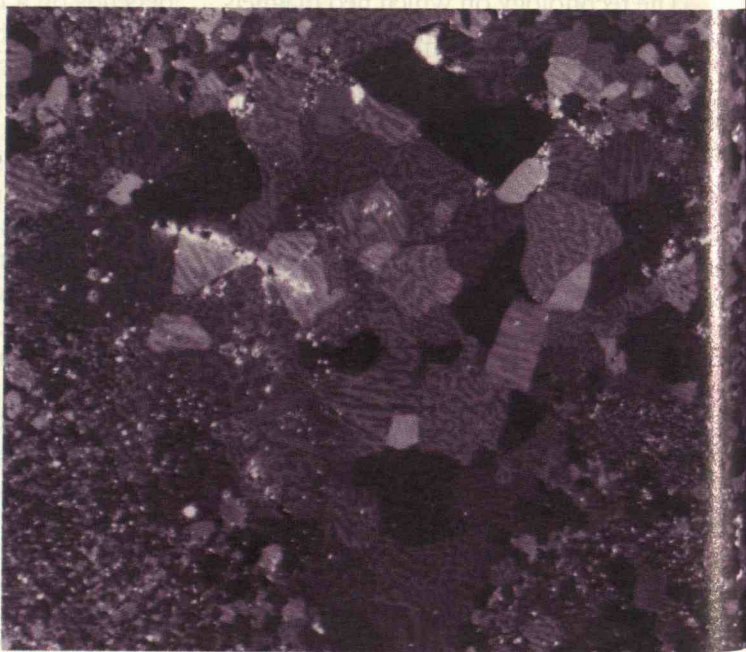
Automobiles alone contain such magnetic sensors to detect engine knock, throttle choke position, wheel and drive-shaft speed (for cruise control), camshaft position, tire pressure, and acceleration (to trigger airbag deployment). Because such sensors usually require only very small magnets, typically weighing a few grams, manufacturers can opt for the highest-performance devices available—meaning neo magnets—without incurring large material costs.

At the other end of the size spectrum one finds magnetic resonance imaging (MRI) systems, which account for a large fraction of the tonnage of iron-neodymium-boron produced today. The stronger the magnetic field, the sharper the image that an MRI can render. For that reason, most MRI systems built today use superconducting magnets, which can produce much stronger fields than permanent magnets and thus render superior images.

Still, permanent-magnet systems have found a substantial market because they require no cumbersome and expensive cryogenics. (Superconducting MRI systems still depend on the old-fashioned, low-temperature superconductors, which must be cooled to only a few degrees above absolute zero.) Moreover, permanent magnets do not produce magnetic fields that extend as far in space as superconducting magnets; these extraneous fields can make working with a superconducting system difficult. And the best permanent magnet by far for MRI is the neo. Achieving a field of 0.2 tesla requires 21 tons of ferrite magnets but only 2.6 tons of neo magnets. Although 21 tons of ferrite magnets are still less expensive than 2.6 tons of neo magnets, the importance

of overall size and weight has made neos the magnet of choice for permanent-magnet MRI systems using fields of 0.2 tesla or higher.

Permanent magnets have hundreds of other applications, from microwave ovens and cordless power tools to gyros and guidance systems for the “smart” weapons used in the Gulf War. David L. Trumper of MIT’s Department of Mechanical Engineering uses arrays of neo magnets with alternating polarity to build a magnetically levitated platform. Such a platform could be used in a photolithography system of the kind employed for producing patterns on semiconductors to make integrated



circuits. Alnico magnets are impractical for this application because of their low coercivities, ferrite magnets because of their low magnetizations, and rare-earth-cobalt magnets because of their cost.

Where materials cost remains the dominant consideration, ferrite magnets are used. But for a rapidly growing fraction of magnet applications, neo magnets are being chosen to do the job. The production and use of the more expensive neo magnets have grown rapidly; if the present trend continues, neo magnets will account for close to half of the permanent-magnet market by the year 2000.

WHAT NEXT AFTER NEOS?

Neo magnets are not without their shortcomings, such as low resistance to corrosion, a rapid decrease in performance as temperature rises, and relatively high cost. Corrosion resistance can be improved with surface coatings, and various alloying additions have been studied to improve temperature capability, with modest success.

There has been considerable research, for example, on iron and cobalt compounds that include rare earths other than neodymium. Scientists at Trinity College in Dublin have come up with an iron samarium nitride with basic magnetic properties similar or superior to those of iron neodymium boride. It has the promise of producing magnets with energy products and coercivities similar to those of neo magnets, but capable of operating at higher temperatures, up to as high as 200

degrees Celsius. The ability to withstand such heat makes the magnets useful in higher power motors, which produce elevated temperatures. The chemical instability of the compound, however, renders it difficult to work with, and no method has yet been found to produce competitive permanent magnets with this new material.

As the Trinity work indicates, permanent magnet R&D is not the exclusive domain of the United States. Trinity's research was carried out as part of a cooperative effort of European universities and industrial laboratories, initiated in the 1980s after neo mag-

nets were first discovered. Research on permanent-magnet materials continues worldwide, particularly in China, which is now second to Japan in total production of neo magnets. China now holds about 80 percent of the world's known deposits containing rare earths, and last October a Chinese group purchased Magna-Quench, the Anderson, Ind., unit of General Motors that makes neo magnets. The Chinese developed the magnetic compass many centuries before it became known in the West, and they are striving to become world leaders in magnetism again.

The price of neo magnets has fallen considerably in recent years, but the difficulty of separating neodymium from the other rare-earth elements present in the ores keeps neos a relatively expensive option—and restricts their use for many consumer applications. But there is

Domains magnetized in opposite directions appear as light and dark regions in this magnified view of iron neodymium boron crystal.

ON THE SOFT SIDE

WHILE neo magnets represent a culmination of centuries-long improvements in "hard" magnetic materials—that is, materials that maintain a permanent capacity for exerting a magnetic force—there has also been progress on soft magnetic materials, which can be rapidly magnetized and de-magnetized. Hard magnetic materials are gauged largely by how resistant they are to having their magnetism reversed—that is, their coercivity. In a soft magnet, on the other hand, low coercivity is the goal. Low coercivity is especially valuable for materials used in the cores of transformers, where magnetic field is continually reversing as alternating current switches directions. The lower the coercivity, the lower the amount of energy that the transformer dissipates as heat.

The best transformer steels are composed of large crystals, with dimensions of millimeters to centimeters. The logic of this is simple: intercrystalline boundaries impede the motion of magnetic domain walls and thus keep coercivity high. If low coercivity is sought, it makes sense to minimize the number of crystal boundaries. The larger the crystal, the fewer the boundaries.

To carry this logic to its extreme, the best soft magnetic material would be amorphous—that is, not crystalline at all. Amorphous materials

have atoms arranged in irregular fashion; they lack intercrystalline boundaries entirely and so permit easy movement of magnetic domain walls. The result is very low coercivity and correspondingly low energy losses. Transformers that use these amorphous materials waste one-third less electrical energy than transformers using the best crystalline steels.

The process for producing amorphous alloys was developed in the late 1970s but has become commercially viable only in the past ten years. In this process, known as rapid solidification, molten iron, silicon, and boron are squirted onto a rapidly rotating, cooled metal wheel. The temperature of the material plunges at a rate of about 1,000 degrees per millisecond—fast enough to avoid crystallization.

Ironically, a similar process of rapid solidification is used in one of the methods of making neo magnets, which are prized for their high coercivity. The result here, however, is not an amorphous microstructure, but one with extremely fine crystals, typically about 20 nanometers in size. The resulting high density of intercrystalline boundaries is believed to be a major source of the high coercivities. ■

—JAMES D. LIVINGSTON

a huge gap in the magnetic properties between the older ferrites and alnicos and the new rare-earth magnets; new permanent magnets with properties superior to ferrites but prices significantly lower than rare earths would find large markets.

Both avenues of development—materials that outperform neos, and those that offer an inexpensive alternative to neos—are wide open, because there are so many compounds whose magnetic properties remain completely unknown.

Several materials have saturation magnetizations much higher than that of neo magnets, and theory suggests that energy products three or four times higher than those of neo magnets may ultimately be attainable. However, none of these materials boasts high enough coercivity to take advantage of the high magnetizations. The right combination of properties has not yet been found. Still, sheer probability gives confidence that there are materials possessing both high magnetizations and high coercivity. Which materials offer the greatest hope? One way to approach the question is to ask what classes of materials have already been exhaustively studied—and then to look elsewhere. For example, the basic magnetic properties of most binary (two-element) compounds have already been measured. The development of alnicos has resulted in thorough investigation of most simple alloys.

What does that leave? Many of the vast number of possible three-element (ternary) and four-element (quaternary) compounds remain unexplored. A big reason is simple numerics: with about a hundred elements available to us, there are about ten thousand pairs of two elements (some pairs of which give a number of compounds with different ratios of the two elements), about a million combinations of three elements, and about a hundred million combinations of four elements. Even guided by their rudimentary understanding of which elements are more likely to work, plus a basic awareness of comparative costs, materials scientists must devote a large amount of research to testing all the likely possibilities. For magnets cheaper than neos but superior to ferrites, I believe that compounds of iron or cobalt with two or more “metalloids” like



Permanent magnets are ubiquitous in modern life, making possible the compact electric motors found in hand-held appliances, CD players, and disk drives.

boron or carbon are particularly promising.

If recent history is any guide, the focus on such materials should put researchers on the right path. The development of high-temperature superconductors 10 years ago came about when researchers turned their attention to such multiple-element compounds; all the high-temperature superconductors contain at least four

elements, and those that superconduct at the highest temperatures contain five or six. Similarly, neo magnets (containing iron, neodymium, and boron) were discovered only when scientists began to study three-element compounds.

To uncover the next generation of permanent magnets will probably require both good luck and a focused program involving at least a few percent of the thousands of researchers who have worked on high-temperature superconductors. Unfortunately, research on permanent-magnet materials has received negligible support from government funding agencies in comparison to the money and effort that have been spent in the last ten years on high-temperature superconductors. Certainly these superconducting oxides are of great scientific interest, and some modest applications are in the pipeline. But the more we learn about these materials, the more we realize how unlikely is the dream of a room-temperature superconductor capable of carrying large currents without resistive losses. Yet, in a sense, we already have such a material in permanent magnets, since their magnetism results from lossless electron motion—albeit at the atomic level. The history of permanent magnets, which records the discovery of materials with steadily higher energy products and coercivities, suggests that even better materials are still out there, waiting to be found, if we invest enough effort in the search.

In the Age of Exploration, magnets in compasses guided Columbus to the “New” World. In the Age of Electricity, magnets in telephones and telegraphs, and in motors, generators, and transformers guided us into our modern, high-tech world. Today, hidden magnets far more powerful than those available to Columbus or Alexander Graham Bell guide the latest devices of our Information Age. It’s time that magnets got the respect that they deserve. ■

MITnews

FROM THE ASSOCIATION OF ALUMNI AND ALUMNAE OF MIT

MAY/JUNE 1996

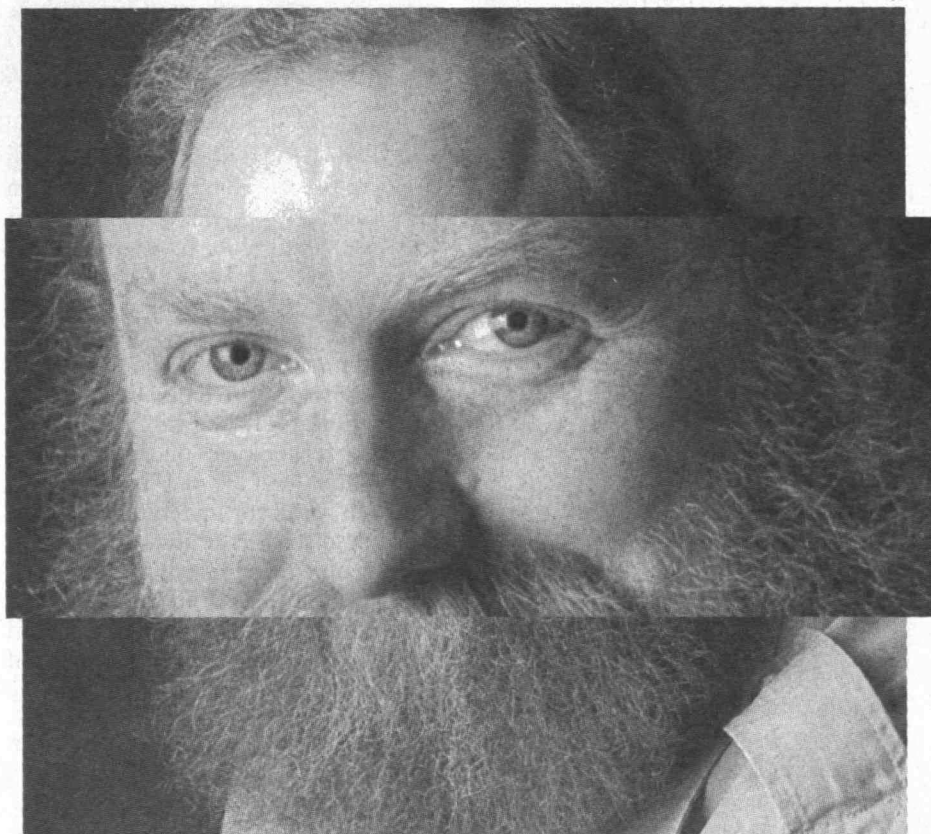
T-Day 1996

Technologies That Will Change Our Lives

Bran Ferren, '74, a Disney Company executive with ties to entertainment, theater, design, and research—and a sought-after speaker for audiences from the International Design Conference in Aspen to the Society of Motion Picture and Television Engineers—will be the keynote speaker for Technology Day 1996, entitled “Miracle or Mirage: Technology at the Horizon.”

Assembling in Kresge Auditorium on the morning of Saturday, June 8, for the opening of the most intellectual of the reunion events, this year's T-Day speakers will focus on emerging technologies in the areas of biotechnology, materials science, and information/communications technology that are most likely to have an impact on everyone's life. It's a theme that the Technology Day Committee chose for its appeal to all classes and course backgrounds and its potential to highlight MIT's role as a knowledge center for the coming millennium, says committee chair Ronald Fergle, SM '86.

It's also a theme that should be a natural for Bran Ferren, executive vice-president for creative technology and R&D at Walt Disney Imagineering (WDI), a subsidiary of the Walt Disney Co. that handles, among other things, theme-park master planning. Ferren is a designer/technologist working in theater, film, special effects, product design, and architecture, and his responsibilities at WDI include overseeing all Disney R&D



activities on both coasts. His design for numerous Broadway shows, rock concerts, and television news magazines has earned him the New York Drama Desk Award and the Los Angeles Critics' Circle Award, among others. He designed a multimedia exhibit of the Bill of Rights now on a 200th anniversary tour across the U.S., and is designing a marine biology and archeology exhibit for the new Christopher Columbus Center for Marine Research and Exploration in Baltimore.

Following the keynote address, David Baltimore, '61 (VII), Nobel Prize recipient in medicine and physiology and the Ivan R. Cottrell Professor of Molecular Biology and Immunology at MIT, will talk about what we can expect from advances in biology and

Bran Ferren, '74, the keynote speaker for Technology Day.

biotechnology. Baltimore will touch on the implications of “designer” genes, antibiotic-resistant diseases, and fat-free, sugar-free, cholesterol-free foods.

From promoting the growth of liver tissue to finding uses for old tires, there are also tremendous advances on the horizon from new and recycled materials, the topic that will be addressed by John Preston, co-director of the Sloan School Entrepreneurship Center and former director of technology development at the MIT Technology Licensing Office.

Rounding out the morning session will be Michael L. Dertouzos, PhD '64,

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May/June 1996

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Students In The News

An enthusiastic report of the spring break activities of 25 MIT students took up almost half the front page of the March 27 Boston Globe, in a story that had to make everyone happy. The students spent the week as volunteers in what the Globe described as the "crisis-stricken schools of Washington, D. C." The project was organized by Anthony Ives, a senior majoring in urban studies, and was supported by D.C.-area alumni/ae, who provided housing for the volunteers, and several MIT offices, including the Edgerton Center, which provided teaching supplies. The Globe writer found Washington teachers delighted with their temporary classroom help and middle school students so absorbed they didn't want to leave when the lessons were over.

—SUSAN LEWIS



Get networked: Use the Internet to update the MIT Alumni/ae Association's information about your address, e-mail, or work by writing to: <mitalum@mitvmc.mit.edu>. To check the Association Web page, go to <<http://web.mit.edu/alum/www/>>.



Technologies continued

(VI), director of MIT's Laboratory for Computer Science, professor of electrical engineering and computer science, and president and CEO of Quantum Energy Technologies. Back in 1979, Dertouzos wrote one of the earliest accounts of the coming information infrastructure, and on T-Day he will again be looking ahead.

Following the morning program will be the traditional T-Day luncheon, an opportunity to celebrate class reunion gifts and the volunteer leadership that made the gifts and the reunions possible.

The theme of emerging technologies returns for the afternoon, featuring break-out panel discussions on more focused topics:

• "How will we live our lives? Social implications for the future," will look at emerging technologies on a global scale. This panel will be led by Rosalind Williams, dean for undergraduate education and student affairs and the Metcalfe Professor of Literature, and will consider the impact of technological innovation on areas such as personal income, community, even the future of education.

• "Can we survive our success? Environmental implications for the future," will be moderated by Professor of Chemical Engineering Gregory McRae. With all the advances in biochemistry, materials engineering, and energy production, just to cite a few, how will the environment cope with diminishing resources and increasing byproducts? What can "green" design, recycling, and reuse accomplish and how is that affected by the political landscape?

• "How will fortunes be made from the new technologies?" Moderator Eric von Hippel, ScD '68 (II), professor at the Sloan School of Management and co-director of the MIT Entrepreneurship Center, will lead a discussion on identifying and funding new technologies and developing them into products through new and existing corporations.

The afternoon will close with a faculty-hosted reception at McCormick Hall, an opportunity to meet with many of the Institute's professors in a relaxed and informal atmosphere.

Last spring, the Institute decided to hold Technology Day on the Saturday immediately after Commencement this year —normally the two

events are up to a week apart. One of the many reasons for doing this was to bring alumni/ae of all ages together; many younger grads had found it difficult to participate when T-Day was held during the week. What's more, "the Technology Day program will benefit," says Fergle, "because of the increased sense of community provided by the mixture of alumni/ae and students."

Vice-President Al Gore will be the Commencement speaker this year, and the tight security measures his presence will entail can be expected to ratchet up the complexity of overlapping reunions and graduation—the Institute's two biggest events of the year. "If it is to be anything like the 1993 Commencement, with Mexican President Salinas," remarked Robert Dimmick, assistant to the Alumni/ae Association executive vice-president, "there will dogs to sniff out bombs and Secret Service agents posted in 10-110 until Vice-President Gore leaves the campus." But organizers are confident that, with careful planning, events will work smoothly.

The whole extravaganza will officially be kicked off on Thursday evening, June 6, with Tech Night at the Pops. Symphony Hall has been reserved exclusively for MIT, and the gathering of reunion-goers and guests along with graduating seniors and their families and friends should make for a full and festive house. A Post-Pops Dessert Reception at Symphony Hall will top off the night. Friday has been set aside for registration and tours of MIT's facilities including the Artificial Intelligence Laboratory, the Media Laboratory, the Departments of Materials Science & Engineering and Biology, the Whitehead Institute, the Center for Cancer Research, and the Athena Academic Computing Facilities. There will also be tours of Literary Concord and MIT-influenced architecture in Boston, as well as a Boston Harbor cruise. Saturday, of course, will bring the Technology Day program as outlined. And the finale on Sunday will be the Techsas Barbecue followed by the intense competition of the Tech Challenge games, pitting class against class. □

—Carol Lademan

Shirley Jackson Faces New Tasks in Regulating Nuclear Industry

Grass isn't growing under the feet of Shirley Jackson, '68, PhD '73 (VIII). Last year the theoretical physicist was appointed by President Clinton to membership on the Nuclear Regulatory Commission, which regulates nuclear reactors and other civilian uses of nuclear power around the country. A mere two months later, she was named head of the agency.

NRC was once heavily enmeshed in issuing licenses for new nuclear reactors, but that day has past: no new reactors are being built in the United States. Today's NRC concentrates on maintaining the safety of existing nuclear facilities around the country and is trying to head off problems as those facilities get older and more prone to failures.

Jackson says her "strategic vision" for the NRC includes continuing to maintain public health and safety and ensuring that regulations are fairer and more effective. A third priority is preparing the agency for new responsibilities, such as regulating uranium-production plants formerly run by the federal Department of Energy (DOE). These plants produce fuel for civilian reactors, but NRC didn't regulate them while they were government-owned. Now that the plants are part of the U.S. Enrichment Corp., which the government is turning into a private, for-profit company, Jackson says, the agency has to formulate appropriate standards for licensing and oversight.

The commission also has a central role in deciding how to handle the growing stockpile of spent nuclear fuel from civilian reactors. Plans for a permanent underground repository were derailed last year in Congress, so the government now seems likely to build a so-called "interim storage facility" that will operate while deliberations continue. The interim facility would be built and operated by DOE, but the NRC would have to certify that it is safe. However, even setting standards for adequate temporary storage will require more research, Jackson cautions, and NRC's research programs are presently threatened by tight federal budgets.

The problem of aging nuclear reac-



*Shirley Jackson, '68, PhD '73(VIII),
Chair of the Nuclear Regulatory
Commission*

.....
tors will also draw the NRC into uncharted territory in the late 1990s. Many U.S. reactors are decades old, and their owners may want to extend their lifetimes rather than simply shut them down. It is up to NRC to monitor the effects of age-related degradation, as well as the efforts to mitigate such effects through maintenance and replacement programs, Jackson says.

"The real value I bring to the agency is my past experience," the new NRC head says. That experience includes dual degrees from MIT: a bachelor's degree in 1968 and a doctorate in 1973, both in physics. Subsequently, she worked as a condensed-matter theorist at AT&T's Bell Laboratories from 1976 to 1991, and in 1992 she moved to the faculty at Rutgers University.

A member of the MIT Corporation for more than 20 years and a life member since 1992, Jackson has taken a leave of absence from the Corporation to avoid conflicts of interest that might arise in NRC business. But she says her experience on the Corporation, particularly in providing oversight of MIT Lincoln Laboratories (a federal facility), has been invaluable in helping her understand the inner workings of the

federally funded research and development centers.

Jackson downplays the significance of her own achievement as the first black female chair of the NRC, but this is not to suggest that she regards issues of race and gender as unimportant. She recalls that her freshman class of 900 included 43 women and about 10 African-Americans. While a student, she worked with MIT administrators to try to expand the number of minorities in the student body, and she has carried this concern into her latest position. Jackson believes that the NRC as a whole should also diversify its staff—its workforce is about 34 percent female and 14 percent minority—while preserving the agency's technical expertise. "Our focus always has to be on the quality and the competence of our people," she told *Technology Review*. In any case, improving the balance will be difficult at a time when Congressional budget cuts are forcing NRC to reduce staff.

Jackson's commitment to diversity is not limited to her agency. In a speech last October to the National Research Council's committee on women in science and engineering, Jackson said that female scientists should take the initiative in helping to create an environment in which they collectively can flourish: "Women scientists have to build a 'sister thing' by recognizing differences—ethnic, cultural, language—and viewing them as sources of strength, [demonstrating] the ability to bring different points of view and modes of thought to bear on a scientific issue."

But she also told the committee that minority women in science and technical fields—who suffer from a "double bind" because they are both minority and female—shouldn't be afraid to capitalize on the very fact that they stand out so distinctly from male and white job-seekers and colleagues. Their distinctiveness can draw attention to their qualifications and accomplishments.

That has been part of Jackson's own formula for success. Good work will be remembered, she told the National Research Council, and she can expect to be exhibit A. —VINCENT KIERNAN

MIT's New Provost for the Arts Honored in Texas

By Michael Erard

The November weather in Austin was wet and cold, and only about a dozen members of the local MIT club could be on hand, but the gathering at the luxurious Driskill Hotel was memorable nevertheless.

The occasion was the visit of Professor of Theater Arts Alan Brody, MIT's new associate provost for the arts, to receive an award for the Best New American Play of 1995 from Austin's respected Live Oak Theatre. Later that evening, Brody—just arrived from England, where he was a visiting fellow at Oxford—would participate in a staged reading of his play, *The Housewives of Manheim*.

An archaeology of American innocence, the play takes place in Brooklyn, circa 1944, in the kitchen of a straight-laced housewife. Through her buffeted life, Brody asks the audi-

ence to consider the many ways in which America has changed since 1944. (The title, says Brody, refers to a mythical painting by Vermeer that he invented—along with the mythical spelling—to carry his story forward.)

"Live Oak Theatre has made a special commitment to new writing, and especially to plays that have a strong moral center," explained Michael Han-kin, the theater's director of new-play development. Selected from more than 300 entries, *The Housewives of Manheim* is such a work.

Brody, who previously served as head of the Music and Theater Arts Section in the Department of Humanities, marvels at the recent blossoming of his career. "It all started happening at once," he says. First came the announcement of the Live Oak award. Then he was appointed to succeed Ellen Harris, MIT's first associate provost for the arts, who stepped down in late October and is now working on a book about Handel. Most recently, Brody was invited for a week of workshops at the annual meeting of the Schools of Theatre in Bucharest in March.

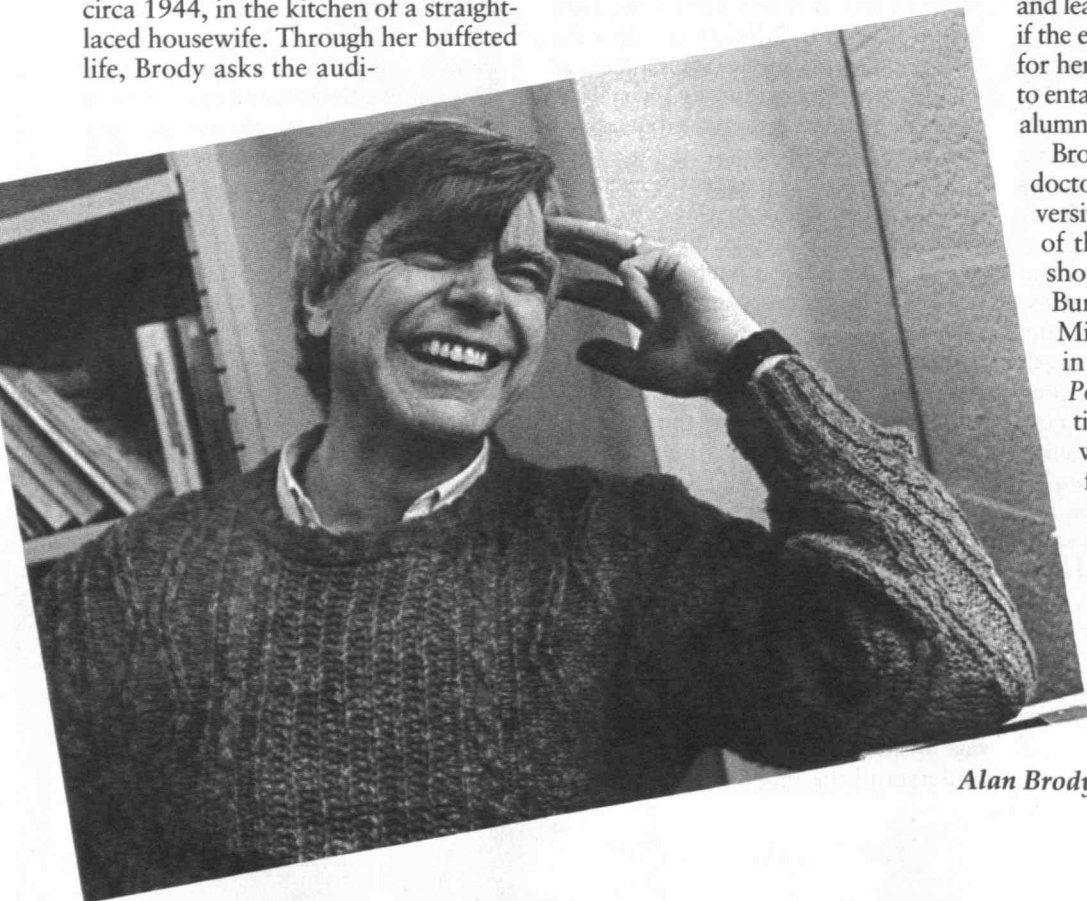
Operating on a cosmopolitan plane is gratifying for Brody, and it seems to go with the territory: Several years ago, he remembers being asked by Harris to sit on a committee looking into a graduate program in the arts. "We had

to change a meeting because the chair of the committee, Jerry Friedman, was going to Oslo," he related. "And I said to myself, where but at MIT could I be on an arts committee chaired by a Nobel Prize winner in physics?"

Even allowing for MIT's uniqueness, Brody admits to being surprised by some of the developments since he was hired in 1988 as the first professor of theater arts. "I'd never dreamed that there would be a theater major at MIT, nor that the arts would be included as a HASS core requirement." But those changes were exactly what he had worked for. In November, President Charles Vest commended Brody's "energetic and creative activities" as central to the growth of the theater arts: In 1989, 55 students registered for theater classes; by 1994, enrollment had risen to 411.

In his new position, Brody will be the administrator responsible for oversight of all creative-arts activities throughout the Institute as well as the senior officer responsible for fund-raising in the arts. Internally, his most important responsibilities will include serving on Academic Council—the body that includes all deans, department chairs, and laboratory directors—and chairing the Creative Arts Council, which includes deans of two schools—Humanities and Social Science, and Architecture and Planning—as well as the department heads and leaders of programs in the arts. And if the example of Ellen Harris holds true for her successor, he can expect the job to entail frequent and lively contact with alumni and alumnae.

Brody, who holds undergraduate and doctoral degrees from Columbia University, was one of the early members of the San Francisco Actors Workshop, where he performed with Burgess Meredith, Viveca Lindfors, Michael O'Sullivan, and Lee Breuer in such plays as *The Touch of the Poet* and the Herbert Blau production of *King Lear*. His recent stage work included the role of narrator for Aaron Copland's *Lincoln Portrait*, performed last summer by the Boston Pops Orchestra. *The Housewives of Manheim* is only the latest of his many plays to be honored with prizes, and the dramatic oratorio on Walt Whitman that Brody wrote in collaboration with MIT Professor Peter Child had its world premier with Boston's



Alan Brody

distinguished John Oliver Chorale in March 1995. And while the outside world may be most impressed that Brody's directing credits include the internationally acclaimed one-woman show by Vinie Burrows, *Sister! Sister!*, what is most valuable to MIT students is his intention to keep directing student-written productions.

In conversation, an animated Brody reiterates his belief that the arts successfully draw on the MIT culture as a resource. "We know of lots of scientists who 'appreciate art,'" he says. "But at MIT we also have people trained in science who are seeing 'a life in the arts' as an option, and they bring an intelligence and another way of being in the world that many artists don't have."

Upon his arrival at MIT, Brody was often told, "You don't understand MIT students." And he admits that there was probably some truth in this. "One thing about MIT students is their extraordinary capacity for literalness," he said. "One of my first years, I was teaching an acting class. I told all of the students, just move back, go stand in the same space. They lost no time in pointing out that they couldn't stand in the same space; it's logically impossible." But several years later, he found himself accusing someone else of not understanding MIT students. "Then I realized that I was going native," he says.

"MIT students can commit themselves to things," notes Brody, "because they are passionate." And while this passion energizes their involvement in the arts, the benefits of the arts are reciprocal, too. "I've had students taking our introduction-to-acting class say that only now do they understand what their lab group is all about," he said.

"MIT is primarily about heads," Brody remarked during an interview in Austin. "Have you ever seen the MIT walk? Let me show you." He found an open patch of floor, and with head thrust forward, he plodded a half-dozen paces, then stopped and laughed. "It's as if people believe that if they could get rid of the rest of their bodies and be pure head, they could do anything."

But one of the great values of the arts is that they help to reintegrate the body and the mind, he explained. And that, to Brody, is a very good thing. □

MICHAEL ERARD, a former intern at Technology Review, is a freelance writer in Austin, Texas.

A LETTER FROM THE ASSOCIATION PRESIDENT

The State of the Association



Of all the elements of the Institute, the Association of Alumni and Alumnae is at once one of the most familiar and least familiar. Status as an alum is automatic, but I expect that few graduates stop to wonder about the organization that becomes their main tie to the Institute once they graduate. Most see the Association in operation at reunions or during fund-raising campaigns, but few have a picture of the whole. I offer a snapshot in the hope that it will tell you more about an interesting and valuable part of MIT, one that we hope will play a continuing role in your lives—and that you may want to help lead and shape.

We estimate that there are now roughly 100,000 living alumni and alumnae of MIT—a sizable bunch—which puts us somewhere in the middle of the pack among our Ivy competitors. Of the living alumni/ae, we have contact with about 86,000. Some of the people for whom we don't have addresses have undoubtedly passed away, but many of the others, especially the younger ones, are simply lost temporarily. Of those we can locate, almost 47,000 were here as undergraduates, slightly more than 39,000 were here exclusively as graduate students, and, overall, some 10,600 are female.

The Association is itself sizable, with a budget of about \$6.5 million and a staff of 92 people, including 22 who work for *Technology Review*, 11 in the records and computing area, and 59 who generally handle alumni relations, fund-raising, and general management functions.

The Association is not quite a department of MIT, nor is it a freestanding entity: It has an independent Board of Directors, but is funded by MIT, and all of the money it raises goes directly to MIT. Its executive vice-president, Bill

Hecht, '61, is the full-time chief executive; he reports to the Association Board but also has a looser reporting relationship with MIT's president, Chuck Vest. The Board consists of up to 30 alumni and alumnae and is headed by a president, and all are named by the National Selection Committee that in turn is elected by Association-wide ballot. Many Board members represent districts around the country, but there are also two representatives from younger classes, two member-at-large positions reserved for representatives from foreign clubs, and a number who serve ex officio because they chair standing committees, such as the Alumni/ae Fund Board.

Besides serving the graduates of MIT, the Association wields some important powers. It names three members to the MIT Corporation each year and roughly 40 percent of the members of MIT's Visiting Committees. It also bestows about 25 awards per year for service to the Association and to the Institute, of which the Bronze Beaver is the highest.

We have more active volunteers than many alumni/ae organizations—about 6 percent of the alumni we know how to reach. Our Alumni/ae Fund participation—about 41 percent of undergraduate alumni/ae and about 31 percent of graduate alumni/ae—also typically ranks among the top three or four schools. Princeton and Dartmouth are the only colleges that routinely report higher participation.

A primary mission of an alumni organization is to enhance the sense of community among the graduates of an institution. We believe that is an important role in and of itself, but we also recognize that people who feel involved will feel more inclined to contribute.

The Association tries to create a sense of involvement in a variety of ways. The most visible activities center around reunions, local clubs, and class notes in *Technology Review*. We now have more than 70 organized classes and more than 80 clubs worldwide, including clubs in Japan, Germany, and Mexico. In recent years, we have put growing emphasis on our outreach to graduate-degree holders and young alums.

We stage quinquennial reunions from the 5th anniversary year through the 70th (15 years ago, the highest reunion was the 55th). We draw about 10 percent participation at the 10th reunion, about 25 percent at the 25th and about 35 percent at the 50th. The Alumni/ae

Fund now raises more than \$20 million a year—about double what it raised in 1985. With help from favorable financial markets, we expect to exceed \$24 million this year and to collect gifts from more than 30,000 alumni and alumnae.

(Only gifts from living alums and amounts up to \$100,000 are counted as part of the Fund; larger gifts and bequests are recorded by MIT's department of Resource Development. Total alumni/ae giving to MIT is typically 2.5 to 3.5 times larger than the Alumni/ae Fund.)

For those parents of MIT students who have something left to give after tuition, we now operate a Parents' Fund that raises more than \$350,000 annually and is a growing part of the Association's portfolio.

The MIT Alumni/ae Association is highly unusual in having an alumni magazine that reaches far beyond the Institute community to cultivate a national circulation. *Technology Review* now reaches 45,000 alumni/ae and almost 55,000 paying subscribers. The magazine was declared by Erdos and Morgan, a market-research firm in New York, as one of the most influential and credible publications in the nation in 1994-95. The *Review's* Web Page on the Internet records an estimated 25,000 individual viewers per month.

But like many publications, the

Review has been faced with soaring paper prices and a decline in advertising nationwide, which has led to higher costs to the Association. So we are now searching for a full-time professional publisher to put the *Review* on a more commercial and cost-effective basis.

Another Association-linked activity is the Enterprise Forum, aimed at helping small companies—especially those offering high-tech goods and services—to grow and develop. Under the auspices of forums in 18 cities, leaders of small enterprises present their business plans in front of an open audience and a panel of experts, who offer critiques from which everyone can learn. Most forums typically analyze 6 cases per year; the average attendance is between 75 and 250. (Cambridge, which formed the first forum, does about 20 cases per year and routinely draws 250 people.)

Enterprise Forum programs rely heavily on volunteer support, both from MIT alums and non-alums. There is one national sponsor, Coopers and Lybrand, and we are seeking more. And most forums have six to twelve local sponsoring organizations.

In response to a survey of alumni and alumnae, we have recently initiated a career-services program for graduates and students, called ICAN (the Institute Career Assistance Network), with a pilot

in California. We are not trying to be a full employment service, but we do provide reference materials and a network of alumni/ae who have expressed their willingness to serve as mentors or talk with individuals about specific jobs.

A second area for important new initiatives is in online services. A volunteer committee headed by Bob Johnson, '63, is examining the possibilities of such services as e-mail forwarding for life, online directories, and lifelong learning by computer network. The Association has a Web page, as does the *Review*, some MIT clubs, and a number of classes. We believe that more and more of our communication will take place over the Internet, and that it will become an ever more important tool for alumni/ae to stay in touch with each other and the Institute.

If you have thoughts about these activities or any others, please let us know. □

Karen Arenson

KAREN WATTEL ARENSEN, '70,
President, Association of
Alumni and Alumnae of MIT;
<dhbm13d@prodigy.com>

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ClassNotes

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We are saddened to report the death of **Waldo B. Clark** of Salem, Mass., on November 5, 1995. As a Army engineer junior inspector in Newport News, Va., Mr. Clark helped

build the first floating dry dock, used to repair World War II troop transport ships. Mr. Clark enjoyed gardening and collecting butterflies at his summer home in Kennebunk, Maine. He is survived by two daughters, a son, a brother, ten grandchildren, and six great-grandchildren.

Herbert A. Dyer of North Branch, N.Y., passed on January 12, 1995. His daughter, **Dorothy Dyer Bennett**, writes to thank the Alumni/ae Association for the many years of remembering her father's birthday. He was always delighted to receive the MIT card, she says, and reports that her father died six months before he would have been 99! "He was such a tough individual, well trained, disciplined, knowledgeable, and with such a wide background of diversified information. I don't think they make men like him much any more, but then unfortunately, I've never known another MIT man!"

Please send news for this column to: Class Notes Editor, *Technology Review*, MIT W59-200, 77 Mass. Ave., Cambridge, MA 02139

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Please send news for this column to:

W.O. Langille, secretary
20 Rogers Rd.
Far Hills, NJ 07931

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Please send news for this column to: Class Notes Editor, *Technology Review*, MIT W59-200, 77 Mass. Ave., Cambridge, MA 02139

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75th Reunion

Please send news for this column to: **Carole A. (Cac) Clarke**, president and secretary,

608 Union Ln., Brielle, NJ 08730-1423;
tel: (908) 528-8881

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We regret to report the deaths of **John F. Robinson** of Gettysburg, Pa., on November 10, 1995, and **Francis M. Kurtz** of Delray Beach, Fla., on February 2, 1996. John's

daughter, **Mary Lou Seamens**, writes "Dad always looked forward to getting his copy of the *Review* as he remained extremely interested in MIT and what was happening there." After receiving an SB in engineering adminis-

tration from MIT, Mr. Robinson went to work for U.S. Steel in Pittsburgh as an industrial engineer. He served as president of the Pittsburgh Chapter of the Institute of Internal Auditors for two years. In 1964, he retired, then moved to Gettysburg in 1978. He is survived by his daughter, nine grandchildren, and 15 great-grandchildren.

Mr. Kurtz majored in engineering administration at MIT, then was hired as an accountant in New York City. Shortly thereafter, he was sent by the A&P to Manizales, Colombia, as a coffee buyer. He spent five years in Colombia, then became president of the A&P coffee division. While in Colombia, he established himself as a respected and sought after advisor to the presidents of Colombia and Brazil. He retired from A&P in 1956 and moved to Delray Beach, Fla., where he continued his lifelong hobbies of bridge and tennis. As a staunch alumnus of MIT, he served as an area advisor interviewing prospective students and assisting with fund-raising.

He married **Carlys Welsh** of Newark, N.J., on February 16, 1929. She predeceased him in July 1989. He leaves their two sons plus 11 grandchildren.

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For the first time since we left Tech, the number of names in our roster has *increased* instead of *decreased*. The last three issues of the *Review* carried the names of all the class-

mates still living, according to my records. The name of **August A. Buhler** was not among them. Recently I received word from August that he is still alive and kicking. He is 95 and living in a retirement home in Mt. Vernon, N.Y. August, your name has been added to the list of living.

For the second month, no deaths!—**Royal Sterling**, secretary, Apt. D201, 2350 Indian Creek Blvd. W., Vero Beach, FL 32966-5103; tel: (407) 562-3937

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Please send news for this column to: Co-secretaries: **Colonel I. Henry Stern**, 2840 S. Ocean, #514, Palm Beach, FL 33480; **Katty Hereford**, 237 Hacienda Carmel, Carmel, CA 93923

25

Milt Salzman provided us with some personal history while attending the 70th Reunion. His SB was in general engineering, Course IX-B. Following graduation, Milt

worked for about five years as assistant to a consulting hydraulic engineer before transferring to Electric Bond and Share Co. as hydraulic engineer on investigation, design, and construction of dams, pipelines, etc., for hydroelectric power plants. He was married in 1930 and worked on construction of dams in Texas. He was assistant professor of civil engineering for one year at Union College in Schenectady, N.Y., and purchasing engineer for Mabrand Products. In 1936, Milt returned to EBASCO Service in New York as consulting engineer in investigation design and construction for electric utility companies. Milt retired in 1968 and did some post consulting services. He has one son, Roy, '55. A daughter, **Barbara**, passed on in 1984, and his wife, **Lillian**, died in 1986. He has five grandchildren and two great-grandchildren. Milt keeps active doing home chores and gardening. He sings with a barber shop harmony chorus and does volunteer service with visually impaired people and church groups. Also, he volunteers to work with community service. Milt recently agreed to be our class agent.

Charles W. Allen writes us from Florida. He graduated from Course XV. In 1926, he went on University Afloat around the world in eight months. From 1927 to 1930, Charles was employed as a time-study engineer by a shoe company in St. Louis. From 1930 to 1956, he worked in family business, **Allen Chair Corp.**, West Concord, Mass. Since 1956, he has resided in Florida. He has been a volunteer in rehab at several nursing homes and has built three homes. He is a charter member of the **Palm Beach County MIT Club**. For 20 years, he played bridge weekly with a group of men. Writing last October, he was moving to **Sarasota** to be with his daughter. Charles recalls that about 85 years ago he lived in a house adjoining **Ed Harris** in **Arlington, Mass.**

As of October 31, 1995, we have addresses for 67 classmates.—**F. Leroy "Doc" Foster**, secretary, 434 Old Comers Rd., P.O. Box 331, North Chatham, MA 02650

26

70th Reunion

We report the deaths and celebrate the lives of the following: **Walter E. Lobo** of New

Canaan, Conn., on November 10, 1995; **Smith D. Turner, Jr.**, of **Staten Island, N.Y.**, on August 23, 1995; **William A. Forrester** of **Manchester, Vt.**, on September 14, 1995; **Alden F. Butler** of **Harwich, Mass.**, on November 25, 1995; **Manfred Rauscher** of **Switzerland**, on January 15, 1988; **George E. Armington** of **Austinburg, Ohio**, on February 17, 1995; and **Benjamin Margolin** of **Cambridge, Mass.**, on June 9, 1993.

Mr. Lobo, graduated from MIT with a degree in chemical engineering. He first devel-

oped exacting design methods for furnaces used in the manufacture of gasoline and diesel fuel from crude oil and in the production of chemicals. Then he worked in the sugar industries of Cuba and Colombia before joining the M.W. Kellogg Co. in 1929. Mr. Lobo retired as director of Kellogg's Chemical Engineering Division in 1959 to establish a private consulting practice in New York City. His firm's clients included the leading oil and chemical companies in Europe, the U.S., and Japan.

George Armington received an SM from MIT and later did a great job designing road machinery that was purchased by General Motors. We do not have any further information on the other deceased classmates.

On a more happy note, **Marvin S. Smith** writes in to report that he and his wife, Elizabeth, will be attending the 70th Reunion, and luckily will have grandson Dan Goodwin with them to do the driving from Delaware and to participate in whatever they do. . . . **Malcolm B. Epstein** plans to attend the reunion, health permitting. He was a stockbroker and investment banker from 1927 to 1992, when he retired. . . . **Eliot K. Grant** is sorry that he cannot attend the reunion. He writes, "Still driving my 29-year-old, two-passenger Mercedes coupe roadster. It's the best looking car at the mall!"

Millard Marquis Greer will be able to attend the reunion. He writes "Hope to see old friends. Have attended every '26 class reunion from 1931 to this 1996 reunion."

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27 Two of our classmates have passed on since our previous notes. **Lauritz H. Rasmussen** of Quincy died on November 11, 1995, at 91 years. He was an engineer for the State of Massachusetts for more than 30 years, specializing in bridge design and construction. He lived in Milton most of his life, retired in 1967, and later moved to Quincy. He leaves a son, Albert-Lauritz, of Neustadt, Germany; a daughter, Dorothy, of Quincy, and two grandchildren.

Lyndall Raymond Perry died August 30, 1995, at home in Mendham, N.J., at the age of 93 after a very brief illness. He was born in Beaver River, Nova Scotia, but lived all his life in the U.S. Upon graduation from MIT, he worked briefly in Chile, but returned to work for The Barrett Company (part of Allied Chemical & Dye), where he had worked part-time during his studies. He worked at the old Everett plant and various chemical and tar plant locations in the Midwest until he transferred to the New York City headquarters. He married Doris Hawkes in 1936 and lived in Old Greenwich, Conn., until Allied moved their plastics division to Morristown, N.J., in 1963 when he relocated to Mendham, N.J. He retired as production manager in 1967, whereupon he was able to devote more time to his love of gardening, walking, and nature study. Summers were spent in a camp designed by him erected in 1934 on the old family homestead on the Bay of Fundy shore in Beaver River.

Lyndall's love of chemical engineering has continued in the family with both sons attaining ChemEs, Leland, '63, SM '65, and Keith (Lehigh '67), and a granddaughter working on

her degree at Lehigh. He is survived by his wife, the two sons, and six grandchildren.

We extend our condolences to the families of these classmates.

As of the first of the year, we have 104 living classmates with known addresses and 84 names without addresses, many we believe are no longer living. All are to be congratulated for reaching their 90th birthday. We have five living in foreign countries:

Wilfred Adlington, Wimslow Cheshire, England; **Hans Bechtler**, Zurich, Switzerland; **George Minassian**, Diredda, Ethiopia; **Manuel Ruiz**, Santander, Spain; **Satochi Uchida**, Yokohama, Japan; and the rest of us live all over the U.S.—**Joseph C. Burley**, secretary, 1 Harbourside Dr., #3501, Delray Beach, FL 33483; **Lawrence B. Grew**, assistant secretary, 21 Yowago Ave., Branford, CT 06405

28 If any of you reading this May/June issue of the *Review* remember the snow and cold of December through February half a year ago, you may wish you could find a foot-of-flurries somewhere to ease your early summer heat discomfort. I have that weather right now outside as I write these Notes. Hardly the instantaneous communication that is assumed for these sophisticated times.

But the times have again taken their toll of our classmates. **Lawrence Fowler Armstrong** died on December 8, 1995; **Chih-Kung Jen** on November 19, 1995, at Silver Springs, Md.; **Walter Francis Mattlage** on October 3, 1995, at Boca Raton, Fla.; and **Abraham G. Stone** on March 15, 1995, at Bethesda, Md. Unfortunately, I do not have other information but we sincerely regret their loss and offer our condolences to their families.—**Ernest H. Knight**, secretary/president, 168 Ai Plummer Rd., Raymond, ME 04071-6349

29 **John E. Dube** of Somerville, Mass., died October 1, 1995. We have no further information at this time.

Please send news for this column to: Class Notes Editor, *Technology Review*, MIT W59-200, 77 Mass. Ave., Cambridge, MA 02139

30 Supplementing the item in the April issue about the newly-organized computer school here at Williamsburg Landing, this project has proved to be gratifyingly popular. We now

have four teachers, each teaching three hours per week. The "student body" comprises about 40 residents, all "computerless" novices. Our objective is to provide the students with enough computer experience to enable them to decide whether or not it would be worthwhile to purchase a home computer.

Olin Stephens' long association with Sparkman & Stephens and his distinguished career as a yacht designer have been previously reported. In a recent communication he mentions the fact that he continues to do some work on yacht-rating rules and computer simulations. He is a member of the National Academy of Engineering and a 1993 recipient

of the Gibbs Bros. Medal of the National Academy of Sciences. . . . **Jack Bennett** reports from Ft. Myers, Fla., that he has "been slowed down considerably by a stroke" but that he is "working on a therapy program at Shell Point Village to regain mobility."

We have at hand two letters from Canadian classmates. **Joe Kania**, writing from Vancouver, expresses his regret at being unable to attend the 65th Reunion. At the time of the reunion he was hospitalized for a series of cardiac tests. Also his Parkinsonism now limits his mobility and has caused him to cut back on his swimming and exercise bicycle activities. . . . Reverend **Vincent Thormin** is still active in church work in Calgary. His latest project was the decoration of a hallway in his church with a 5x8-foot mural. He sent me a color photo of this painting which reveals what is a most impressive achievement for a 90-year old Course IV graduate.

From Ft. Wayne, Ind., **Ted Ross** writes that he and Betty have moved to an apartment at Georgetowne Place, a retirement complex. He says, "We get most of our meals in the common dining room and the food is very good. The decor is beautiful and there are many activities available for our enjoyment." Ted likes to play the piano in the second floor foyer for anyone who comes by to listen. Since their zip code is unchanged, their new home is apparently quite near their former longtime home on Spanish Trail. . . . Recently the **Yicka Herberts** and the **Gordon Listers** signed up for a Mediterranean cruise on the *Maasdam* of the Holland America Line. We will embark from Lisbon on April 28, visit seven ports, and debark at Rome 12 days later. You may expect further details in a later issue.

We recently received a delayed notice that **Ralph Draut** died on April 10, 1994. According to my records, Ralph worked for most of his career for Martin-Marietta on engineering assignments in Baltimore, Omaha, and Orlando. For the last six years before his 1971 retirement, he worked for the Federal Aviation Administration on the supersonic transport (SST) program. After his retirement he did a bit of work for AIAA in Washington. Ralph's first wife died in 1970 and he later remarried. As of about 10 years ago he and his second wife, Maxine, had a total of five children and five grandchildren.

More recently we have received a notice of the death on September 14, 1995, of **Charles F. Parker** who did a bit of graduate work as a special student at MIT in 1930. Parker received an undergraduate degree in civil engineering from the University of Maine in 1928 and, after his stint at MIT, a master's degree from Cornell in 1937. For most of his career he worked as chief engineer for Hinman, Inc., and Blue Rock Industries. His specialty was road design and paving. He was a consultant for the construction of turnpikes in Maine, New Jersey, and Kansas. He is survived by his wife, Berenice, and a daughter.—**Gordon K. Lister**, secretary, 5707 Williamsburg Landing Dr., Apt. 40-D, Williamsburg, VA 23185

31 65th Reunion

Our 65th Reunion is just around the corner—June 6–8. Responses indicate, as reported

by Ben Steverman, class treasurer, that 20–30 '31ers will be attending—with high hopes that they will bring along as many generations of family as they wish—children, grandchildren, and even great-grandchildren. Among such attractive events as Tech Night at the Pops, a Charles River Cruise, and a visit to the Boston Museum of Science will be our class banquet on Friday night. Ben has put together a fiscal time machine so that we will be paying for the banquet in 1931 terms: \$2.50! (Compared to the “real” 1996 cost of \$40, it's a bargain. Who says you can't go back in time?)

Since our last column, we've heard that Charles Broder plans to come, and Edward H. Goodman might make it—we're hoping many more of you get inspired and make the trip. If you have not received a registration mailing yet and are interested in attending, please call our program coordinator at the Association, Elizabeth Simons, (617) 253-8232.

On a less cheerful note, we must report the passing of C. Randolph “Randy” Binner, our class president. Randy graduated in management with us and was a brother in Theta Chi. He helped the class raise money before becoming president in 1988, where he served until his death last February 13. Retired chief engineer and VP of Great Lakes Carbon Corp., Randy was involved in his longtime home of New Canaan and surrounding towns. His two great-grandchildren, three grandchildren, two sons, and daughter helped make it fulfilling. Hope, Randy's wife, reported to John Swanton that they had celebrated their 60th wedding anniversary in August. We are thankful for such a rich life, and that Randy chose to share so much of it with the Class of 1931 and with MIT.—Ed. (Wyman P. Boynton, secretary, 668 Middle St., Portsmouth, NH 03801; tel: (603) 436-1309)

Please send news for this column to: Class Notes Editor, *Technology Review*, MIT W59-200, 77 Mass. Ave., Cambridge, MA 02139

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I received a nice long letter from Ben Chadwick. He and his wife, Marion, have moved into a lovely independent retirement home in Dover, N.H. He is organizing his boxes of Marblehead memorabilia. He has been invited to give a slide lecture on “Old Marblehead” at the annual Historical Society meeting in March. I hope to be there. The Chadwicks keep in close touch with their children and grandchildren who are spread throughout the U.S. Ben has spent much time with his garden and his trout pond. He attends the bank weekly meetings where he is active as a director. The Chadwicks hope to attend our 65th Reunion.

We are pleased to announce that Wendell B. Bearce has agreed to serve as our 65th Reunion Gift Chairman.

The Class of 1932 Scholarship Fund will continue to assist Michelle Neben and Joseph Lee. Here is an update on what they do. Michelle is now a senior and is receiving our scholarship for the third year in a row. She continues to excel in her Course VII (biology) major, where she maintains an almost perfect grade point average. She plans to apply to medical school for next year. Michelle volunteers at the Massachusetts General Hospital and the Kennedy Elementary School, sings

with the MIT Concert Choir, rows for MIT's crew, and edits the Course Evaluation Guide. She also belongs to the Ballroom Dance Club, just for fun!

Joseph Lee, a junior, is also considering a career in medicine and has likewise compiled an outstanding academic record in his Course V (chemistry) major. He is also a volunteer, as an assistant for patient care in the operating room at Brigham & Women's Hospital. He worked in a UROP (Undergraduate Research Opportunities Program) in the joint Harvard Medical School HST/Dana Farber Cancer Institute program both during the school year (for credit) and full-time over the summer. Outside the classroom, Joseph serves as an officer in Sigma Chi fraternity, sings with an a cappella group, works as a martial arts instructor, and plays tennis. . . . I hope we will be able to meet them during our 65th Reunion.

We have written a few times about the accomplishments of our classmate Lawrence Berk. We told how he was unable to find work as an architectural engineer so he founded the Berklee College of Music in 1945 with three students. Today the college has 2,700 students from 70 countries and is the most famous jazz school in the world. When he received the Pepsi Boston Music Hall of Fame Award in 1993, he deprecated his own contributions: “I feel kind of guilty accepting the award,” he said, “because actually, it was the kids who came out of the process who made things great.” He died December 24, 1995, at the age of 87. In addition to his son, who lives in Brookline, he leaves two granddaughters.

Mrs. Linda Mulliken informs us that Alfred Mulliken died September 20, 1995, at the age of 85 in Fort Myers, Fla. He was formerly executive director of Chemical Specialties Manufacturers Association of Washington, D.C. He was a past-president of the Whiskey Creek Country Club and a member of the local chapter of SCORE for the past 20 years. He is survived by his wife, Elizabeth, four children, and eight grandchildren.

We have learned that William A. Kirkpatrick died on March 20, 1995. When we receive obituary information, we will pass it on. . . . John M. Hollywood writes that he is in a nursing home. Keeping comfortable is getting more difficult all the time. . . . All for now! Write!—Melvin Castleman, secretary, 163 Beach Bluff Ave., Swampscott, MA 01907-1643; tel: (508) 531-0053

33

More news of the courageous exploits of Charalee and Dick Fossett's son, Steve, whose January attempt to beat two other hot-air balloon teams to be first to circumnavigate the globe ended in disappointment after 51 hours. Steve said he was embarrassed by his failure, but Paul Harvey, the well-known commentator, remarked that “Steve Fossett was the most humble hero since Lindbergh.” It became evident to me this Christmas, judging by the number of holiday cards I received, that we all share the same good will and admiration for Steve, even though we are only related to him through our MIT connections. . . . Abraham Chertock wrote to say that my holiday card was “one more example of the multiple talents residing in the MIT community,” giving me a

ClassNotes

theme for these notes. In addition to our own gifts, we can also be proud of our talented wives. For example, John Longley's wife Lillian sent a reproduction of a watercolor of hers, *Across Washington Park Lake*, a sparkling, speckled-white wintry scene. . . . Thomas Galvin's wife, Rita, sent along a hand-crafted silkscreen. Sorrowfully, she had to report that Tom is now hospitalized with a very rare affliction that causes bleeding blood vessels. In his earlier days, Tom played with the Reading Symphony Orchestra.

Clarence “Clare” Fare, whom I remember from our 60th reunion for his enthusiasm for life, writes that he lives in his rehabbed home, built circa 1904. He suffers from osteoporosis, but says he still works the piano keys. Here's hoping he'll be at the 63rd Reunion playing “I wish I were back at the Tech on Boylston Street” for us. At MIT, Clare was in Masque, Baton, the Tech Show, Orchestra, Musical Clubs, and the Techonians. . . . Speaking of this coming 63rd Reunion on June 6, 7, and 8, there are changes from Reunions of the past, so watch your mail for the details. The Reunion agenda is not ironclad, but the dates are. . . . Our president, Wilber “Desert Bill” Huston, thinks he will have bragging rights as the classmate coming from farthest away from Boston. Bill says some javelinas (wild boars) ate his Halloween pumpkins left on the porch overnight. He also reports that his two grandsons (3 and 6 years old) are monopolizing his computer. Bill and Aline—his wife of 50 years—their daughter, her husband, and the two boys all live happily in one house in Fountain Hills, Ariz.

Due to a snafu, the Alumni/ae Office sent some mail meant for me to Frank Phillips, secretary of the Class of '36. When Frank called to say he would send it on, he asked for the address of Roland D. Glenn, his fraternity brother at Theta Delta Chi. I found that Roland Glenn holds several degrees from MIT, plus the “T”—Crossed Oars credentials beginning with Frosh through Varsity Crews. In the Varsity Crew of 1933 picture with Glenn were also Cyrus “Cy” Hapgood and my late architectural classmate James “Jimmy” Dunlap, their coxswain. . . . Paul J. Pettitmermet says he retains good health and enjoys meetings of the MIT Club of San Diego. Paul lives in La Jolla, Calif., along with our class agent Herbert E. Grier and George L. Cory, who practices architecture out there. . . . Norm Spofford is having problems with a whiplash injury to his neck, unrelated to the two hurricanes that have rearranged his beach but did no damage to his home. Norm says there are no alumni brethren nearby, so his sole contact with us is at Reunion time. . . . Newland F. Smith, Jr., wrote that he was in Evanston, Ill., to attend the wedding of a granddaughter last summer, the hottest summer ever recorded in these parts. As of Jan. 20 this year, the lowest temperature ever recorded in Chicago was minus 27 degrees Fahrenheit—an incredible 133-degree difference from a record high of 106°.

Leonard Julian and wife Doris were experiencing a frightful winter in Boston before they

left for Florida and Arizona. Leonard had delayed hernia repairs, but he's out of the woods now and can travel. . . . **Werner Bachli** and wife Jeanette are gung-ho hikers. Werner has been with the Adirondack Mountain Club since 1963 and he is also a director. He has left off hiking for awhile after spending two weeks last summer as a hike leader. But Jeanette still hikes three miles each day. . . . **Edward Simpson** and wife Ida dropped me a line from Florida, saying that Ed was recuperating fairly well and that they both will make the 63rd Reunion, as they have so many others. . . . **Morris Guralnick** and wife Doris sent me a beautiful card of a John Singer Sargent watercolor called *The Shadowed Stream*. Morris prepped at East Boston H. S., where my closest sidekick at MIT, **John G. Danielson**, also prepped.

Harry G. Steinman, who is well remembered from our last reunion, says that he thinks I influenced his 9-year-old grandnephew to study architecture with my Coutances Cathedral card. But Harry has been feeding the boy a diet of postage stamps depicting buildings, so he should take the lion's share of the credit for setting Matthew on his way toward entering the MIT School of Architecture. Dr. Harry struck up a friendship at the Reunion with Dr. **Edward R. Atkinson**, who, contrary to a previous report, is not from Newburyport. . . . **Mrs. Edward W. (Poly Varney) Marshall** has been practicing architecture while also engaged with her husband's career and raising two daughters. She mentioned her change of address as 311 Badger Ter., Carleton Willard Village, 100 Billerica Rd., Bedford, MA 01730. Do write her.

Information on the death of **Julian J. Klein**, Course II, on December 10, 1995, came to me from Mrs. Mildred Klein, along with an obituary from the *Newton Graphic*. Julian also held a degree from Bentley College and was an accountant as well as a registered professional engineer. A designer of a broad range of valves and gauges, he began his professional life as a production supervisor for the New York, New Haven & Hartford Railroad. He later worked at Manning, Maxwell & Moore in Watertown and at Crosby Valve & Gauge Co. in Newton

Center, before retiring as a consultant to Stone & Webster in Boston. He served as an officer with the 764th Railway Battalion in the U.S. Army Transportation Corps in France during WWII. Besides his wife, Mildred, he is survived by daughters Linda Klein and Eleanor DeFreitas.

The following account of the death of **Alfred Peter Bruce** on November 27, 1995 is mainly from Dr. Ed Atkinson. Both were graduates of Course V, chemistry, and they communicated throughout the following 63 years. Alfred Bruce was in Masque and the Tech Show and is well remembered for his elaborate set of electric trains, which he set up for Course 1-A (Railroad Operations) open houses at MIT from 1930 through 1933. After graduation, Al returned to his hometown, New York City, where he married Bella Bechard and worked for one of the "alphabet agencies" of the Great Depression. He then joined Dun & Bradstreet, but was inducted into the military, finding himself in the midst of the bombing of London. In the late 1940s he worked with the Gorton fish empire in Gloucester, Mass. During a labor dispute in the Boston area, Al was the driver of a truckload of fish that was hijacked on Rte. 128, which made the front page of the Boston newspapers. In 1963, Al moved to Staunton, Va., with his wife, son, and two daughters and set up a cabinet-making business. When Bella died in 1983, Al became active in local Roman Catholic parishes, although with steadily deteriorating health. A memorial mass was held in his honor at the Salem, Va., Lady of Perpetual Help.

I have a new phone number: (847) 272-8683. As the phone operator would say, "please make a note of it."—**Berj Tashjian**, secretary, 1245 Briarwood Lane, Northbrook, IL 60062-4556; tel: (847) 272-8683

34

As a native of Central Massachusetts, your secretary felt a kinship with a group of Springfield Tech graduates who met at Freshman Camp. (This was the Freshman Camp

where Karl Taylor Compton attended and told us that he was a member of our Class, as he too was a freshman.) In the group from Springfield were: Fred Barrett, Ted Kresser, Charlie Wright, Draper (Dippy) Williams, Felix Conti, and Jerry Ansel, who subsequently became my roommate midway through our Sophomore year. Felix Conti (Course I) went on to own his own construction company, later becoming the chairman of the Massachusetts Associated General Contractors and for six years its chief negotiator with the trade unions. When Felix retired in 1978, he felt that he could make a contribution to improved relationships between management and labor, particularly in the building trades. Seven years ago, he helped found and became one of the original trustees of both the Laborers-Employers Cooperation and Education Trust (LECET) with offices in Washington, and the New England Laborers' Labor-Management

Cooperation Trust. Both groups dedicated themselves to project procurement, an effort that translated into tens of thousands of jobs for laborers and millions of dollars in profits for their employers. In addition, the New England group, of which Felix is secretary-treasurer, awards \$84,000 in scholarships annually to children of construction-union members and has also built training facilities in Massachusetts and Connecticut that are turning out skilled workers. At the time of our 60th Reunion, Felix created a scholarship fund at MIT for the children of building-union members and pledged \$100,000 for a scholarship. He wants to help average, good students, whose needs are great. . . . **Charle Finnigan**, writes for the first time since graduation: "My class was Course VI-C, a very small one, so that I have not much chance of running across a classmate. After graduation I worked for a number of companies in TV and military electronics, including RCA, Stromberg-Carlson, Crosley, Sperry, and Martin. After retirement I worked for some time as a real estate broker, which enabled me to acquire a string of income properties. They yield a much better income than engineering, with considerably less work." Charles reports that he has a home on a lake where he sails and fishes, holds a private pilot license, and is active in radio, computer, and astronomy clubs—even having taught astronomy at Rollins College and at the University of Central Florida. He has four daughters, six grandchildren, and one great granddaughter. Recently his life has been saddened because his wife has Alzheimer's and is now in a nearby nursing home, but his own health is good, although he does have some deafness and cataracts. "I have resolutely kept busy as a hedge against failure of physical or mental health. So far I have beaten the rap. Best regards."

We have word of the passing of **Marcy L. Sperry, Jr.**, on November 6, 1995,

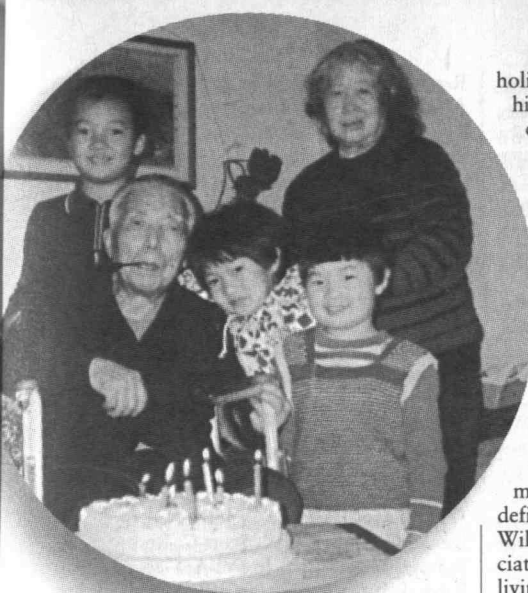


Lionel Galstaun

with no other information at this time. . . . **Lionel Galstaun** writes that he is in good health, widowed, and occupied with woodworking, music, reading, some travel—recently going from Danbury, Conn., where he lives, to the West Coast and to Washington, D.C.—and volunteering on his church's building program. . . . **Walt McKay** wrote, **Mel Sousa** called—both had received Christmas cards from **Wing Lem Wu**. Wing reports that he is doing fairly well after the stroke he suffered three years ago, diligently using a self-walker to recover his ability to walk. Your secretary's December mail included a note from Wing and a picture of Wing and his wife, Li Rong Xing, and three of his grandchildren, taken on his 87th birthday. Wing would be delighted to hear from any one who would care to write. . . . **John Carey** writes from Clearwater, Fla., that both he and his wife are in good health. They have three children (one of whom they visited in San Francisco in November), six grandchildren, and three great-grandchildren. John reports that he reads constantly, plays golf and



Felix Conti, '34 (with beard), cutting a ribbon at the dedication of a training center named in his honor.



Wing Lem Wu, '34, his wife, Li Rong Xing, and three of his grandchildren, on his 87th birthday.

bridge regularly, and is on a regular exercise routine. At MIT John was an outstanding student, president of the Tech Catholic Club, a member of the boxing team from 1930 to 1934, its co-captain in 1932-33, and—a rarity in MIT athletics—Eastern Intercollegiate 145 lb. Champion in 1934.

William Coleman writes that he lost his son in April of 1995. The son, who was buried in Pennsylvania, leaves three daughters, ages 8, 12, and 14. The Class extends its deepest sympathy to William and his family on this sad loss. Williams reports that his chief hobby is his computer, although he occasionally enjoys a good Western. He says that he is a terrible golfer and a fair bridge player. . . . In a Christmas card, John Berger reports that he is well and spending a white Christmas with his daughter. He sends greetings to all. . . . Max Winer writes that he has retired from his consulting work in the desalination of water and incineration of polluted soil. He now spends his time on computers, financial planning, and the management of a condo he owns in Hyannis. Your secretary ran into Max and his wife at the Newton library recently, and they both looked very good. . . . John D'Albora sends

holiday greetings and a photo of Rosalie and himself. They are both well and have two children, seven grandchildren, and three great-grandchildren. They have recently visited Williamsburg, Va., and toured Italy. John volunteers for both church and community service, including a Telephone Pioneer project and visiting hospitals and nursing homes. He collects stamps, does woodworking, and likes to read about technical subjects and traveling. He walks and spends some time in the exercise room, and sees other classmates occasionally.

William Milliken and his son, Douglas, have written *Race Car Dynamics*, which was published by Society of Automotive Engineers (SAE) and is considered the definitive reference. The two are still operating William's company—Milliken Research Associates. . . . Norris Parks writes that he is still living at 21 Stratford Road, Newport News, VA, after 21 years of retirement. He is working on genealogy and local and marine history projects. . . . George R. Lawrence died in September of '95. He was 86 and had been ill for some time. A native of Fall River, George was an engineer at Sperry Gyroscope in Great Neck, Long Island, for 35 years. For many years he owned and operated Lawrence of Riverhead, a Long Island hotel- and restaurant-supply dealership. He was a member of Delta Tau Delta. He leaves two sons, L. Geoffrey, of Bristol, Vt. and Trent, of St. Thomas, Virgin Islands, one grandson, and his friend and companion, Phyllis Rackliffe of New London, N.H., where he has lived for the past 4 years. The Class expresses its sympathy to his family and friend. . . . Bob Ebenbach sends word that he is "now fully retired. Have limited energy due to defective heart valve and deficient kidney function, but able to do house chores, food shopping, and limited travel. Am enjoying Philadelphia Orchestra concerts, TV wildlife, and PBS events. Am kept going through efforts of my wife of nearly 18 years, who, while still teaching, keeps a sharp eye on my activities and needs."

We have word from Ernie Massa, currently living in Pompano Beach, Fla.: "Jeanette and I have enjoyed attending all past major reunions, especially our 60th, which happened to coincide with our 54th anniversary (June 1). Since the class is getting smaller, maybe [we] should consider informal yearly get-togethers." In answer to Ernie, we will have a

table or tables at Technology Day in June. We also will have had an informal get-together in April and will discuss another in June, but no promises. In the December mail was a card from Annette and Ed Asch. They have been bounding around Europe and the United States, but most of the news will have to wait for the next issue. Annette is expecting the arrival of a grandchild in the spring and they will be in California for the event.

Word was received recently of the death of Robert Scott Miller, Course II in March of 1993. We regret that we had no previous information.

ClassNotes

Robert operated the Miller Engineering Co. in Everett, Mass., for many years and his son tells us that he was always very proud of his affiliation with MIT. There are no other details available. A letter from President John Hrones tells us of the death of Ed Sylvester. John tells us of his long friendship with Ed. The men played hockey for MIT for three years, and John saw Ed and his wife, Esh, twice a year. The September *Review* has a picture of Ed, John, and Dick Lawrence '35, in a mock hockey scene in John's kitchen. Ed was born in Norwell, Mass. Ed went on to get a master's at MIT and then joined the research staff. He started at American Steel Foundries, and three years later he was assigned to Griffin Wheel Co. He researched the development of an improved product, a pressure-poured steel railway wheel and later he became president of Griffin Wheel. He built plants in Canada and the U.S. to manufacture wheels using his technique and was awarded the Melville Medal from the American Iron and Steel Institute in 1954. In 1955 he set up a new company in South Africa to make pressure-poured railway wheels and in 1957 he moved to Cleveland to take over American Ship Building, the largest maker of ships on the Great Lakes. He led the company into such innovative shipbuilding practices as jumbo-sizing ore boats and became a director and later chairman of ASB Co. In 1962 he formed Sylvester Enterprises to design and engineer steel pressure-pouring equipment. Ed was an amateur rocketeer and kite builder and flyer and had a unique collection. Besides his wife, Esh, he is survived by sons Edmund Q. III of Hinsdale, Ill., and Michael of New York City, daughters Ann of Bratenahl, Ohio, and Elisabeth of Dresden, Maine, seven grandchildren, a great grandchild; three stepsons; a step grandchild, and two step great-grandchildren. We are indebted to the *Cleveland Plain Dealer* as well as John Hrones for the information. This concludes our notes for this month.

We will be back in Massachusetts by the first of April.—Carl H. Wilson, secretary, 48 Druid Hill Rd., Newton, MA 02161-2033

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As this issue goes to press, we are very sorry to learn of the deaths in mid-March of Hal Bemis, class agent, and Allan Mowatt, class secretary since 1985. Details will be forthcoming.—Ed.

Two students are receiving funding in 1995-96 from the Class of 1935 Memorial Scholarship Fund. Jeffrey Morrow, '96, continues from last year as a '35 recipient. Edwin Foo, '98, is new this year. Jeffrey Morrow, a senior from Corham, Maine, is a double major in math and music. Remarkably, Jeffrey continues to maintain a cumulative grade point average of 4.9 (out of 5). Beyond his studies he is involved in a wide range of performance groups at the Institute: he is currently the personnel officer for the Concert Band, he performs with the MIT Symphony, the Premiere Orchestra (a student-run ensemble dedicated



Rosalie and John D'Albora, '34, on Mother's Day 1995

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to the performance of new compositions), and the Chamber Music Society. During the term, he works in the music library and pursues his interests in musical composition and conducting. He had a UROP over the summer in the music department. His career plans lie in the field of music.

Edwin Foo, a sophomore, comes originally from Texas but currently hails from Scotch Plains, N.J. He majors in electrical engineering and computer science. Edwin's studies at MIT began early, he graduated from high school after the 11th grade and entered MIT at age 15½. The summer before coming to Cambridge, Edwin was a lab technician/assistant on research pertaining to commercial applications of high-temperature superconductors at Texas State Conductivity Center. This past summer he was an intern at MIT Lincoln Laboratory doing computer programming/systems integration. He plans to pursue a PhD and then "participate in engineering-based activities, including inventions and business activities." Outside of class and lab, Edwin volunteers at Cambridge-area elementary schools, is involved in Chinese Bible Fellowship, and plays a variety of intramural sports. He is also an accomplished pianist, having won third place in a state-level piano concerto competition during high school, and then performing a concerto with the Clear Lake Symphony Orchestra in the metro-Houston area.

This month we celebrate the life of Thomas Hafer who passed away on October 10, 1995. He was a Course VI man. His death was the result of a streetcar accident in Brussels the previous August. Tom was assigned to the Springfield Armory in early 1940 as an ordnance officer and served there until the end of WWII. After the war he joined Raytheon and became director of manufacturing planning at their Lexington headquarters. He progressed to assistant to the VP for international operations at Raytheon's Rome office. In 1970 he moved to Brussels and joined ITT of Europe as program manager. He married Mariangela on December 20, 1972. After retirement he traveled extensively in Europe and the Far East. He is survived by his wife, a daughter Susan, and a son Robert. I am sending our condolences to his wife. . . . Jim Eng sent me a note with information about Tom Hafer saying he had been assigned to the Springfield Armory at the same time; other '35ers there were Larry Stone and Bob Olsen.

Your secretary is not able to hold a golf club yet, but soon surgery will clear that. I would still like to hear from a few of our 60-year nonwriters.—Allan Q. Mowatt, secretary

Please send news for this column, temporarily, to Walter Stockmayer, Box 361, Norwich, VT 05055-0361; tel: (802) 649-1710.

36 60th Reunion

The last of canvass mailings to our quiet classmates went out November 1. A recap of the 96 enquiries shows 43 replies, and 14 deaths reported. Also, Pat Patterson and I visited 8 classmates, and 13 may have felt there was nothing to add to their 50th biographies. Forty-five percent of graduate students responded, and 48 percent of undergraduates.

Replies came from as far away as South Africa, Adrian von Maltitz; Hong Kong, Chic Lam; and Tokyo, Tom Kato's daughter. Of known students who had to leave before graduation: 11 responded, 8 did not. Beginning in July I hope to call all nonresponders whose telephone numbers are available.

Missing entirely from the canvass were 24 classmates with degrees whose addresses and telephone numbers are unknown. Will anyone with a lead on the following names please call me or send a postcard with your telephone number: Tom E. Brown, VI; Robert G. Edwards, XV; Carl Engstrom, XIII; Robert N. Gilmore, XV; James W. Griffin, II; Carl A. Hedberg, VI; Lyman P. Hill, IX-A; Richard B. Hitchcock, XIII; Albert J. Klemka, X-B; Albert H. LeShane, XVIII; Joseph F. McClean, VI-C; Donald McCluskey, XV; John N. Pappas, III; Daniel C. Person, XVI; Scott C. Rethorst, IX-B; Luigi L. Robinett, Jr., VI-A; George M. Ryan, I; Justin J. Shapiro, VII; Morris Sorkin, VI; Benigno Souza, VI; Sidney Speil, VIII; Stanley B. Stolz, VII; Evelyn Trimble Swartz, IV; and Carl B. White, VIII.

From Hong Kong, Chik Lam (Course I) tells of having been a justice of peace, president and 40-year board member of YMCA, and board chairman of Lam Woo Co., which built the biggest dam there—150 feet high—and many schools and colleges. His honors include member of the British Empire and Doctor of Humanity from Springfield (Mass.) College. From three children Chik has seven grandchildren and one great-granddaughter named Serene. . . . Darby Merrill (originally in Course VIII, but his 1939 SB was in IX-A) responded with a February 1994 issue of *Mitre Matters*, the house organ of the spin-off from MIT's wartime Lincoln Laboratory. *Matters* included a tribute: "Bushnell Darby Merrill, MITRE's oldest employee, retired on his 80th birthday in December (1993), after 33 years work on intelligence systems applications and analysis, with a wealth of experience in optical engineering and space systems design. During seven years as an Air Force officer in WWII and Korea he was decorated by General Ira Eaker for demonstrating the merits of color photography under combat conditions in 11 missions over Europe in B-17s and B-24s. Darby is famous for his early arrivals at work—often before 5 a.m. While officially working part-time for the last 10 years, he logged over 7,000 voluntary hours." More about the 1936-39 situation (above), and Lobby Lobdell's part, in another issue, and it is hoped Darby will be one of several tale-tellers at the opening reunion dinner on June 4 at the Dedham-Hilton.

Bill Orrison (Course I, SM), seventh from left in back row of the 50th Reunion photograph, received an SB in '34 at Texas A&M. He worked briefly with a Texas survey crew paid in depression script, and the National Park Service in Virginia where he also designed an earthen dam, which got him transferred to the national HQ. In Washington he wrote proposals to Congress for new parks, lived with his grandmother, and saved for maybe one term of MIT's \$500 tuition. Pennell Aborn at TCA directed him to a job I had just left for VI-A co-op work in GE's Pittsfield high-voltage lab—driving two elderly ladies in their 1926 Cadillac (only two wheel brakes on those Newburyport Turnpike hills!). Compensation: room and board for \$25 per month,

which he earned at another part-time job, figuring component (even rivets) and total weights of Cape Cod bridge designs. With his Tech degree and varied experience, "many years have passed and many jobs completed, while working for other firms, e.g., Gibbs and Hill, and some larger ones in business for myself. I really enjoyed my year at MIT." He has a son and two daughters, each with degrees and professions, and has had two happy marriages: Mary died in 1983 and Bill is remarried to Jettie Burns.

A note from **Eli Grossman**: "A few years ago **Henry Johnson** and his wife, Dorothy, learned that a Brazilian relative of mine was an exchange student at a high school in their Michigan area. Very thoughtfully, the Johnsons invited her to an outing." . . . And from **Fred Assmann**: "The January Notes mention 'all widows of alumni/ae.' How can there be widows of alumnae?" No mea culpa this time. Somewhere between my typed "alumni" and TR it was translated to alumni/ae. . . . A card from **Bob Van Patten-Steiger**: "Tuck into your computer that we'll be moving back to Myrtle Beach, S.C., some time in the spring."

Cheers for the lives of **William A. Reilly** and **Walter Seinsheimer**! Both left Tech before graduation but had careers of accomplishment and satisfaction. Bill put three protective clothing manufacturers together and ran the combination until 1975. Then as a publisher he advertised his wares by putting first chapters on the Internet (April '95 Notes) to reach a wide market. His widow, Joan, told of his looking forward to the 60th Reunion but he died October 23. . . . **Walter Seinsheimer** was in good health when I visited him and wife Betty in Cincinnati October '93 (See April '94 issue), but thereafter Alzheimer's disease became apparent and progressed rapidly. Mercifully, he died on June 6, 1995. Betty tells of his being very ethical and honest. Small wonder that he was so widely respected in his career as a top-notch labor-management arbitrator!

Please let me meet and talk with you at the 60th.—**Frank L. Phillips**, secretary, 1105 Calle Catalina, Santa Fe, NM 87501; tel: (505) 988-2745

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We have all envied Ed "Hobby" Hobson's large family, but wait until you hear this. For his 80th birthday, his family gave him a grand barbecue bash in Rye, N.H., with

well over 100 of his friends and relatives honoring him. They came from near and far: New Zealand, Vancouver, Florida, Missouri, Toronto, and Tennessee. That's not all. There was an airplane "fly-by" towing a "Happy 80th Hobby" banner and a TV sound bite on the six o'clock news. To cap it off, there were so many cards and letters that they filled five photo albums. In his impromptu remarks, Hobby said he very much appreciated everyone's efforts. He has continued his air hopping all over the U.S., getting full value from his two airline passes. Keep it up, Hobby, you are an inspiration to all of us.

Remember one of our graduation gifts in 37—a scholarship fund? Well, word from the Alumni/ae Association advises that, during the 1995-96 year, the award was made to Timothy Macinta, a junior from Cambridge, Md. He is enrolled in Course VI (electrical engineering and

computer science) and maintains an outstanding grade point average. He works part-time at the MIT Aero/Astro Library, is very active in Sigma Alpha Epsilon fraternity and, just like many of us, keeps his hand in the World Wide Web. I am sure we all wish him well and trust that he will continue his good work.

Not such good news from our president, **Phil Peters**, who is still grieving from the loss of his wife, Ruth. "After 55 years of a loving and happy partnership, this has not been easy," he says. Then, on a skiing trip last year, he suffered a serious eye injury from his ski pole when he encountered an "inexplicable" fall. He has had two operations and expects to be on the road to recovery. Before his accident, he traveled to the Mideast on a four-week trip sponsored by the Harvard Divinity School, visiting New Delhi, Agra, and Bombay, India, then on to UAE, Oman, Yemen, Saudia Arabia, Jordan, and Mount Sinai. On a later trip, he planned to visit Singapore, Kuala Lumpur, Rangoon, Bangkok, and Hong Kong.

A reliable source in Hanover, N.H., reports that architect **Frank J. Barrett** still lives in good health in the house he designed and built in 1951. At age 84, he enjoys reading, watercoloring, painting, and reflecting on his extensive travels throughout Europe and the Soviet Union before retirement in 1985. He lost his wife, Dorothy, in 1994 after 54 years of marriage. He has three sons—a civil engineer, a lawyer, and an architect. Over the years, he designed numerous churches and schools in New Hampshire and Vermont.

John Nugent's sister Mary brings us up to date on his not-so-good doings: "A few months ago, he gave me quite a scare by landing in the hospital with a heart problem. It happened because he decided to work on our old dishwasher. Lying on his back all afternoon produced a clot in the carotid artery! He was a lucky boy to come out of it so well." Her letter continues with more mundane matters: "We have treated ourselves to a satellite dish, which is installed on our chimney. We are particularly enjoying the House and Senate channels."

There is good news about **Joe Smedile's** wife, Martha, in Delray Beach, Fla. Long confined to a wheelchair, she had an operation in a Miami hospital and no longer has a "dropped foot"; she can now place it squarely on the floor. She has had physical therapy sessions and is slowly regaining some measure of walking. There were a number of trips to Miami before and after the operation, and Joe was the designated driver. Martha describes the situation: "While only 50 miles away, the trip was mainly on Interstate 95. South of here, there are six lanes in one direction and the speed limit is 55 mph. Joe tried to stay with the flow of traffic, but it was not unusual, while cruising at 70 mph, to have other cars and trucks pass us on either side. After each trip, Joe felt like pasting a decal of I-95 on our car, just like the bomber crews in WWII painted small bomb decals on the noses of their aircraft after a successful run."

In another part of Florida, the story is a plaintive one. **Joe Heal** and wife Marion are having a difficult time with the ordinary day-to-day activities. However, they are celebrating the birth of a new granddaughter, and Joe hopes to be at Technology Day. . . . Still more Florida news from June and **Walt Wojtczak** who recently celebrated their 55th anniversary

ClassNotes

and his 80th. They have two great-grandsons (he calls them second-generation grandsons) whom they visited in California. . . . All is well with Professor **Charles M. Antoni** in Syracuse, N.Y., and also with **Bardolf Storaasli** in Durham, N.C., where he is the neighborhood "fix anything" man, loved by all the old ladies and widows, according to his wife, Ruth. He retired back in 1976 from the Allis Chalmers transformer design group and has been involved in hardware and maintenance work since then, along with music, computers, and travel.

Gilbert Mott retired from Olin Corp. in 1982, where he was VP of planning. He is a consultant with the National Executive Service Corps and has served on several volunteer boards. He is president of the Greater Bridgeport Symphony. He and his wife, Rosemary, live in Fairfield, Conn., and have four grandchildren. I wonder if he remembers rooming across the hall from me in Bemis? . . . **Bob Thorson** wants to thank all of you who sent good wishes and personal greetings. He is now fully recovered, and his wife, Rose, is finished with a long coughing spell. . . . We have just received belated word of the death of **Austin Loomis** of Tolland, Mass., without further details. Our regrets to his family.

Can you believe that, a year from now, we shall be convening for our 60th Reunion? Hope that all of you who can will start to make plans when you hear from the reunion committee.—Co-secretaries: **Leonard A. Seder**, 1010 Waltham St., 342-B, Lexington, MA 02173; **Robert Thorson**, 66 Swan Rd., Winchester, MA 01890

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Do you wear your 50-year MIT jacket on your home turf? **Don Severance**, living at River Woods in New Hampshire, where there are two other MIT alumni, cut quite a

figure when all three appeared New Year's in their red MIT jackets. Don and Phyl work out on the many ski trails in local woods and explore the coasts of New Hampshire and Maine. They took time out for a three-week trip to England, Scotland, and Wales. During the blizzard of '96, while the snow was being whipped horizontally past his desk window, Don wrote about what happened after the last storm when he was told by one cross-country ski area that their trails were groomed daily. He and Phyl took their skis there—only to find that they were the only ones on the trails—no machines, no tracks, no other skiers—but they had a good workout.

Don sent news about **Russell Coile**, who is busier than ever as disaster preparedness coordinator for the City of Pacific Grove, Calif. In the November/December Notes, we reported on his presentation of papers in England. He continued with additional presentations on disaster preparedness and emergency response teams at the University of Colorado, at the American Society of Emergency Planners in Providence, R.I., and at Monterey Peninsula College where he talked on "prevention of

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nonstructural damage in schools at an earthquake workshop.

As of mid January Harold Strauss was deeply concerned about the recovery of his wife, Henrie, who suffered a fall before Christmas that, combined with other problems, led to hospitalization and later transfer to the Barlow Respiratory Hospital, a part of the University of Southern California.

A newspaper clipping tells us about Frederick Kolb, Jr. who at a September reception in New Orleans was presented the Technicolor/Herbert T. Kalmus Gold Medal awarded by the Society of Motion Picture and Television Engineers. The Kalmus Medal was presented for contributions to color imaging. Fred is active on several engineering committees looking at projections, sound, and new technologies; and on IT9s task force on the storage and archival stability of magnetic recordings. He is also president of the Kodak Genealogical Society, active in the long-range planning committee of the Summerville Presbyterian Church, and in addition to all this, president of the Class of 1938.

From notes with Christmas greetings to Fred come a number of the following. From Isobel and Fred Reuter: "Just returned from a college tour of the eastern technical schools with my young (17) genius grand nephew. He picked RPI. Ugh! Went to an MIT calculus class in 10-250—didn't understand a single word, but my nephew ate it up! Saw John Craig in New Haven when we visited Yale. He was deluged with grandchildren. We're planning a big family reunion in Victoria this year to celebrate Isobel's 80th birthday." . . . Betty and Andy Stergion write: "We are back to parenting as we have a grandson living with us as he attends senior year at the local high school. This is most interesting." . . . Jack F. Chapin: "Have kept very busy nearly the entire year cleaning up after having about 300 trees taken off the property." . . . Louise and Ira Lohman: "We are fine and busy with our photographic business—shows, displaying photographs at the Portola Art Gallery, etc. Ira does most of the work. Louise has activities at the forum and some still in Saratoga. This year we went to northern England, the Dales, Lake Country, Wales and the Cotswolds. Then later to Cleveland and Michigan, enjoying the lovely fall foliage on the Upper Peninsula."

From E. and Frank Gardner: "One of the highlights of the year was a fabulous trip to the Grand Canyon, Lake Powell, Bryce and Zion National Parks. Then, in November, just to add a bit of excitement to our already busy life, E fell and broke her leg. Because of the great exercise classes we have attended twice a week, she is now, in mid-December, getting around without a cane. Frank proved to be an expert cook and caregiver." . . . Jo and Frank J. Kearny: "In September we decided it was time to share some of our lifetime of 'saving things' (from our first marriages, our respective parents' and grandparents' homes), things we were no longer using such as dishes, silver, glassware, etc., including many things from Frank's extensive workshop. This sorting out of what to keep and what to distribute proved to be much more time consuming and labor intensive than we either had expected! On November 5, while ushering at church, Frank began having chest discomfort. Through prompt action, they were able to abort a mas-

sive heart attack. Following heart catheterization, balloon procedure, and the insertion of a stent, he came home in a week and was doing well enough to plan on going to Perdido Key near Pensacola from the end of December through February."

Last summer Millie and Edward K. True traveled from London to Plymouth to Wales and then on to Yorkshire, on the way visiting several towns from which many of Ed's ancestors emigrated to the colonies in the 17th century. Of particular interest was a visit to a small parish church in the town of Wistow where his grandfather, a Down East yankee from Maine, married an English girl in 1888. So now he has several relatives to visit in England. Millie and Ed spend the winter in Port Orange near Daytona Beach, but return to Maine as soon as the ice breaks up in the spring, hopefully before the next scheduled mini-reunion. . . . Bernard Zuckerman, a Course XV classmate, spent his career in the textile industry and was associated with Campus Sportware Co. in Cleveland for many years, serving as VP for engineering. Subsequent to retirement in 1983, he spent a few years consulting on plant engineering and facilities. At present he is a volunteer with Jewish Community Federation Repair and Replacement, is a Cleveland Hillel board member, a Kent State University Hillel board member, and he continues his work with Habitat for Humanity.

Charles R. "Dick" Bartels, a retired chemical/environmental engineer and VP of the Massachusetts Archaeological Society, died unexpectedly January 9, 1995, at his home in Lexington, Mass. During WWII, Dick served as a captain in the Chemical Warfare Division of the U.S. Army stationed in Pine Bluff, Ark. After the war, he worked for 16 years in research and development with E.R. Squibb & Sons where he made major contributions to the production of many pharmaceutical products including streptomycin, penicillin, and vitamin B-12. For his patents and publications relating to these products, he was elected to the Squibb Institute for Medical Research.

For the 20 years prior to his retirement in 1982, he worked as an environmental engineer for a division of gulf Oil Corp. focusing on groundwater pollution. After retirement, he moved from Westfield, N.J., to Lexington, Mass., where he studied and worked in archaeology. He was active in the cataloguing of Native American artifacts at the Peabody Museum at Harvard University and was chairman of the Robbins Museum reconstruction project in Middleboro.

Dick E. Acker, who moved to East Sandwich from Bedford about three years ago, sent us the obituary on Dick Bartels and reminisced about going from Bedford with Dick to see the archaeological dig his group had under way, then on to Middleboro to check out the museum. On another occasion, they went to Seekonk to speak to a group of people at the town library about local archaeology. Dave states: "My remembrance of him is of the same Dick Bartels we knew 60 years ago with the same old manner of speaking."

He continues: "Dick and Bert Grosselfinger were good friends along with a few others, and I became a part of the circle when I moved into the dorms our senior year. Bert and I still exchange Christmas cards. He wrote this time that he was just back from Italy and Morocco

where 'we found the beach near Casablanca where we landed on November 8, 1942.'" Dave concludes by saying that nearly two years ago he had angioplasty. Its benefits were short-lived, but medication and frequent vigorous walks since then have been remarkably effective. He can handle two hours of snow shoveling. This winter put him to the test.

Ed Hadley has made the arrangements for our mini-reunion with a salon available beginning at noon Friday, June 7, and dinner at 6:30. You should have received all the details in the mail about the Wyndham Garden Hotel in Waltham off Exit 27A of Route 128. We hope to see you there.—Paul R. Des Jardins, secretary, 6251 Old Dominion Dr., Apt. 310, McLean, VA 22101-4807; tel: (703) 534-4813; G. Edwin Hadley, mini-reunion chairman, 50 Spofford Rd., Boxford, MA 01921-1504; tel: (508) 352-6040

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Will Jamison's career covered a wide spectrum of challenges. He developed an expanding foam, useful because it could quickly fill tunnels and snuff out fires. Efforts to sell the

idea to this nation's fire departments failed because utilities delivered water free to fire sites. He did, however, provide equipment and foam to a Tokyo liquid natural gas tank farm. Will's idea and equipment is now protecting millions in Japan against massive fires and explosions. Will is retired in MacMurray, Pa., where he says his score at golf exceeds his age.

Granville Carleton and Barbara administer investments and manage real estate in Beverly Farms, Mass. Granville's career included engineering on aircraft engines manufactured by General Electric Co. Barbara is active with Wellesley classmates.

Ten MIT students receive funds from the Class of 1939 Scholarship Fund. Three receive renewed funding and seven are new recipients. For the 1995 school year, a total of 1,591 students declared need and received scholarships. Our members' combined contributions are helping 10 of the 1,591 optimize their potentials to produce benefits for society. Home-towns of the 10 include St. Louis, Mo.; El Paso, Tex.; Lenaxa, Kans.; West Chester, Pa.; Bratislava, Slovakia; Westport, Conn.; Brandon, Miss.; Flushing, N.Y.; Oakland City, Ind.; and Cicero, Ill.

John Hobstetter replied modestly about career achievements. After MIT, he earned a doctorate degree at Harvard and contributed on the technical staff at Bell Laboratories. At UPenn, he was founding director of the Materials Research Laboratory, vice provost for research, graduate dean, and emeritus professor. Now at Sewell, N.J., he grows orchids, enjoys classical music, and reads history.

Scotty Merriman and Nina retired in Cheshire, Conn. Their chores extend to a second residence on Block Island. Scotty was active as Scoville Manufacturing Co. expanded and diversified. Living in Cheshire as it grew from 4,500 to 26,000, he participated in community affairs including zoning and planings. Shorty corresponds with Paul Sandorf in San Clemente, Calif., but Shorty didn't say whether Paul sends homegrown avocados from California to Connecticut.

Orlando de Aragon writes: "I am now fully retired, and enjoy activities in the Seabee Vet-

erans Association and the Equestrian Order of the Holy Sepulchre of Jerusalem."... Seymour Sheinkopf and Sylvia write: "Mel Falkof and Lucille will make their annual six-week visit to their son and daughter-in-law who live in a kibbutz in Israel. On return trip, they will visit in Belgium and the Netherlands."... Bob Saunders and Sybil expect Fred Cooke and Eugenia to visit in March.

John Alexander and Nancy skied for a week at Sun Valley. After return to their new condo on Mercer Island, they bused with their ski club to confirm their slalom skills on Mt. Rainier. They relay news that Bob Withington and Betsy sold their Miller-45 sailboat and bought a Grand Banks-36 power boat. Decisions in retirement for Bob and Betsy are a wee bit tough these days: after breakfasts they look across their lawn onto Lake Washington and have to choose whether to speed under power in their 36-foot cruiser on the lake or fly over it in the two-seater monoplane Bob built from a kit and flew on its maiden flight about four months ago.

Fred Grant and Ginny have seven large-size white jackets, with MIT letters sewn on in red, left from the '39er reunion at Newport. The jackets are ideal for sports including sailing. For \$20 each, classmates or schoolmates can have them, postpaid. Make checks payable to MIT Class of 1939 and mail them to 22 Edmunds Rd., Wellesley, MA 02181-2933.—Hal Seykota, secretary, 2853 Claremont Dr., Tacoma, WA 98407-2332

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Class President Bruce Duffett sends a note mentioning several of our classmates. . . . Paul Bollerman visited Europe in October. . . . Norm Klivans has gone to Naples, Fla., and

is working on a mini-reunion with Sam Card, who is in Cape Coral, Fla.; Joe Wiley is ready for the 60th Reunion; and Walter Kahn and Bill Morrison have volunteered to be communicators. . . . Bruce also included some information on Walter's activities as a master restorer. Much of this was reported in an earlier column but the current piece refers to Walt's interview on New Haven, Conn., Channel 8. . . . Al Barton wrote to Bruce that he has six married children, and had 23 family members at the Christmas table in the Bahamas.

James Buchanan Rea died on September 21, 1995, in Los Angeles. In addition to having earned a doctorate in aeronautical engineering, he was a mutual fund manager, a jazz pianist, and a surfer well into his 70s. He was a former Convair test pilot, flew Boeing 314s for Pan American Airways, was head of systems analysis in Douglas Aircraft Co.'s missiles division, was an engineer on an ocean liner, taught piano and accordion, and led an orchestra at Lake Tahoe.

Continuing with some of the comments that members included with their class dues:

Joseph Wiley hopes that the 60th Reunion in the year 2000 will be in Cambridge. . . . Wally Schuchard wrote that he had written about a dozen letters to classmates but had only three replies—from Tom Creamer, Joe Wiley, and John Kapinos, each of whom wrote a long letter. Wally will write to each of the people again after his wife, Peg, recovers from a broken hip. . . . John McKee hopes to get to see the year 2000.

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Norman Klivans made reference to his tentative plans with Sam Card and Geoffrey Roberts to make a pitch to the MIT Club of SW Florida, Sarasota, about sponsoring an all-classes Florida reunion. . . . Harvey H. Brown comments that his dues should take care of the current millennium. . . . Barry Taft is still working part-time helping his two children, who bought his truck tire retreading business. Barry and wife Marge spent a week on a cruise in the Gulf of Mexico, following Barry's angina attack in September. He's doing fine now.

Ray Keyes writes that, in spite of having flunked freshman English, he now writes books reviews for the local newspaper, which keeps sending him more books to review. He won't be able to attend any future reunions, as his old body is too shot. He regrets that he will not be able to see his boyhood hometown of Watertown, but he is enjoying life close to his Yakima River, West Richland, Wash., home. . . . Marshall McCuen is unable to be a communicator, as he missed the 50th and 55th Reunions, so would not have much to say. He is in a retirement home in Indianapolis, as he can't walk by himself and had to resign from Education Council work.

The Winston-Salem (N.C.) *Journal* carried a news article about hydronic home heating systems, which Willard Morrison is still running. The firm, Advanced Environmental Systems, has made over 4,000 installations. . . . E.P. "Digi" DiGiannantonio included with his dues a packet describing his company, V-Disc Corp., which distributes WWII music programs on CDs and cassettes. . . . George Wolfe is still working part-time as a travel agent and doing some consulting work. In addition, he spent the Christmas holidays in Jamaica with his family, including two granddaughters, as well as going on a February cruise through the Panama Canal. . . . Wylie Kirkpatrick sent the most positive note about the future. He commented that, as the IRS tables say we're good for another eight years or so, he will go for another four years on the dues. He does some boating, puts out a monthly bulletin for the boating club, goes to Elderhostels, and takes courses at a nearby liberal arts school.

Another note from Class President Bruce Duffett to Treasurer Dick Babish mentioned that dues were received from Delos Churchill and Hyman Freedman. Also, Knight Carson suggested using the class treasury to improve and modernize instructional facilities at MIT. Bruce thinks this is a good idea and will discuss it with other class members.

There are still more notes on hand to start the next column, but keep your letters and calls coming to Richard E. Gladstone, secretary, 250 Hammond Pond Pkwy. 1205 S., Chestnut Hill, MA 02167-1528; tel: (617) 969-5161.

41 55th Reunion

Happy deductions day to classmates who must have responded on the appropriate section of their annual gift request from MIT. Their news was subsequently forwarded to me: Robert Wilson Blake writes, "Had a pleasant month in England in August including a course at Oxford on the English Civil War. What a mess that was! I bought a rail pass and

made day trips out of London — Canterbury, Portsmouth Naval Shipyard among them. Spent much of a day on the *Cutty Sark* at Greenwich. I'm now working on a model — I'm a *Cutty Sark* freak. Looking forward to the 55th! (Wow!) Off to Beaver Creek in February for a ski week (free lift pass for over 70)." . . . Clement "Cal" F. Burnap writes, "Working as much time as required for Inter-city Testing and Forensic Engineers, supplying experts to insurance claims personnel and attorneys to determine what actually happened in auto, personal, and property damage situations. In golf, I say I'm 78 (with a high handicap for a trick knee). I'm beating it so watch out! Since July, I have won or placed in some eight tournaments." Clem, who lives in Alameda, Calif., graduated with an SB in Course XIII and SM in XV. Intrigued by our activities, he wrote a letter about our 55th. He may well show up. Beware, you Calloway golfers!

Warner Knight writes, "With family on both coasts, we manage to get some interesting trips, including a visit to Mesa Verde Cliff Dwellings in southwest Colorado. I'd always visualized these as overlooking a vast desert. I was so surprised to find them at 8,500 feet and set above a deep canyon. Tough living for a basically peaceful people! Happy to support Tech in whatever way I can." . . . Julius A. Kohn, Course IIA, a five-year cooperative student, got an SB and SM in '42. He writes, "I'm retired from GE. We still live in Burlington, Vt., overlooking Lake Champlain. I'm still active in SCORE and AARP and can still do 10-mile mountain hikes without undue strain. My wife, Viola, is active in the American Cancer Society. Our son is working hard training for a second career after 12 years at IBM. Our daughter and her husband are both full professors at the University of Toronto." . . . Robert W. Mayer writes, "Jinx and I are celebrating our 50th wedding anniversary on October 27, 1995." . . . From Majorie (Quinlan) Swift: "I enjoy reading Class Notes so I'll contribute my bit. I'm still in the house we bought in Waltham in 1944. It has been fun keeping it up and adding comfort items like air conditioning and a lawn sprinkler system. Retirement from the Department of Public Safety Crime Lab in 1987 gave me time for some travel, canoeing, and sailing."

Not all news received by MIT is good. Mrs. Charles B. Britt, Fairfax, Va., responded to our 55th Reunion invitation that her husband had passed away on February 4, 1993. We're sorry some information lapses can never be explained. Charlie, his wife Aurilia assures us, cherished his years at MIT and would have enjoyed attending our 55th. He joined us sophomore year, transferring from The Citadel. At MIT he was a member of Course VI-C (communications option), Sigma Chi, Radio Society, Advanced ROTC-Coast Artillery, and was advertising manager of *VooDoo*. Called to active duty in the U.S. Army in July 1941, he was released as a major in February 1946. Charlie followed his interests in radio and communications throughout his career. In 1948 he was VP and general manager of radio stations WLOS-FM in Asheville, N.C., and in 1961 was listed as owner of Charles B. Britt Co. in the same city. In 1967 he moved to Wilmington, N.C., with no business listed, but by 1975 was president of radio station WFTR, Front Royal, Va.

Will Mott informs us of a more recent passing. The *New York Times* obituary tells us that **Arthur J. Spear** died in Los Angeles on December 31, 1995, after a series of strokes. I met Art the summer of our freshman year, and when we became friends, spent a weekend at his home in nearby Providence, R.I., I attended his first high school reunion and there discovered that he was a talented accordion player and very popular with his high school class. We at MIT made good use of this information, persuading him to entertain at one of our most successful mid-year dances at Walker Memorial. We gradually lost track of each other as architecture projects and chemical engineering labs took their toll. As a member of Course IV (five-year program), Art actually graduated in 1942 and was called to active duty in the Army. After the military, he spent a dozen years at three New England manufacturing companies before joining Revlon as an executive VP overseeing its manufacturing operations. He later joined Mattel, Inc., in a similar capacity, and in 1973 was named president. When Mattel's founders, Elliot and Ruth Handler, were forced out in 1975 in a scandal over the company's making false financial statements to securities regulators, Spear was put in charge. According to the *Times*, one financier said Art had "inherited the most incredible mess you have ever seen . . . Mr. Spear quickly restored Mattel to profitability." By the time of his retirement in 1986, Art had led Mattel through a restructuring after losses from an unsuccessful diversification into an early, ahead of its time, electronic game system, and again restored the corporation's profitability. He accomplished this with the strong cashflow from Barbie dolls and other toys and an infusion of cash. Between 1973 when he became president and his retirement, Mattel's annual sales rose from \$281 million to \$1 billion dollars. Art is survived by his mother, three brothers, two sons, a daughter, his former wife, Roberta, three stepsons, seven grandchildren, and ten step-grandchildren. The class expresses its sympathy to the families of both Charlie Britt and Art Spear.

Mal Abzug sends a full page of the Lifestyle Section of the *Palisadian-Post*, with an article about volunteer trail construction in the Santa Monica Mountains. Veteran trail builder, Mal is shown installing a 2-foot, 6-inch footbridge on a difficult portion of the Leacock trail. Mal takes issue with the reporter. He tells **Chet Hasert** that the bridge was 2 feet, 6 inches wide and 10 feet, 6 inches long. "That reporter would call the Golden Gate Bridge a 60-foot bridge!" he says. Congratulation to Mal on his recent election to the National Academy of Engineering. . . . **William C. Bauer** is listed with our class by virtue of receiving an MS in chemical engineering that year, although he was awarded an ScD later. Course X-A classmates will remember him as the assistant director of the Practice School Station at the Hercules Powder Co., Parlin, N.J. From Estes Park, Colo., Bill writes in familiar Bauer style: "To: Secretary & Poet Laureate; From: Former House Guitarist." (By way of explanation, Bill and I occupied a house with other military and civilian workers in MIT war-related research during WWII. He admits to turning to our Class Notes when he gets a copy of *TR*, and now recognizes names of classmates, besides those in Course X-A. He continues, "For the past 20 years I've had my

own tiny consulting firm doing chemical engineering projects, with a heavy slant to the glass manufacturing industries. In recent years most of my effort has been forensic in nature, serving as an expert witness in product liability and accident cases." His enclosed Christmas card, pictures an elk with a 6 x 7 point rack, who cruises their backyard. Bill refers to him as the "resident rack," and Bill and his wife have named him Hartford. They were planning to celebrate their 50th wedding anniversary on a "tramp" freighter in the Caribbean where they plan to "overindulge in snorkeling, eating, and rum swizzles." I've written Bill and invited him to revisit the '41-'42 Course X-A members, meet those other classmates he's beginning to follow in the Notes, and join three others of similar bent. . . . **Cal Barnap** (above), **Bob Youngquist**, and **Court Perkins**, have all inquired about our Reunion at Martha's Vineyard. They've all been sent information and I hope to see them there. By the time the rest of you see this, it may be too late to sign up, but if anyone has a change of heart, call Elizabeth Simons at MIT, and see if she can squeeze you into what should be a great time! Please send news to: **Charles H. King, Jr.**, secretary, 7509 Sebago Rd., Bethesda, MD 20817-4839; e-mail: <olspaceman@aol.com>

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Pleasant dinner and evening at the Edgewater Beach Hotel with **Hazel and Fred Gander**, **Audree and Jack Alktruse**, and **Charlotte and Ed Edmunds**.

The Edmunds visiting from El Paso where Ed and his son have several businesses on both sides of the border. . . . Picture of **Rita and Steve Stephanou** from Santorini. Steve reports that they mostly travel, ski, and fish. Does sound like a good life!

. . . **Jack Quinn** was honored by the Flight Test Historical Association at the "Gathering of Eagles" in Lancaster, Calif. J.J., an early test pilot, did the first flight of the YF-89 aircraft.

Planning is moving ahead for our 55th Reunion in June 1997. Class President **George Schwartz** notes that **Bill Denhard** and **Lou Rosenblum** are directing the planning, which is focusing on a resort stay in Newport, R.I., and traditional activities on campus. **George, Bill, and Lou** will be attending the 1996 Technology Day on Saturday, June 8, and invite any classmate who is available to join them immediately after the Luncheon for a discussion of possible Reunion events. The meeting is scheduled from 2:30 to 5 p.m. in Private Dining Rooms 1 & 2 of the Stratton Student Center.

Send news!—**Ken Rosett**, secretary, 281 Martling Ave., Tarrytown, NY 10591

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Leading off with some good news, the word about **Chris Matthew's** miraculous survival and recovery is being promulgated through the Alumni/ae Association e-mail

network, thanks to **Robert Dimmick** in Cambridge. . . . **Prexy Jim McDonough** rated a photo and bio article in the *Alumni/ae Volunteer News*. It was included in the February/March *Technology Review*, in case you missed it. . . . Seasons Greetings come from **Herb**

ClassNotes

Twaddle (Course X), reporting on a trip he and **Barbara** took last spring to Paris and other French venues. During a bus tour through Normandy and Brittany, they found themselves in conversation with the brother and sister-in-law of **Morris Rosenthal** (Course IX).

Sue and Harry Ottinger (Course X) celebrated their 50th wedding anniversary in 1995 by taking their children and grandchildren to Costa Rica. As of Christmas, Harry was in the sixth week of recovery from a double knee replacement. He likens the pain and anguish to what he used to suffer in a thermodynamics quiz. Ah, the agony of the entropy! . . . An obituary notice reports the death of **Raymond R. Richards** in Milton, Mass., on February 21, 1995. Raymond was a semi-retired consultant for the Koehler Manufacturing Co. in Marlborough. He is survived by his wife, **Randi**, to whom we extend our condolences. . . . **David B. Mitchell** (Course II) has registered his dissatisfaction with the term "Alumni/ae" Association, considering it unbearably P.C. How about "Alumn-E-I-E-I-O"? . . . From Willow Street, Pa., **Gilbert Monet** reports that he and **Marion** are still among the survivors. **Marion's** sleeping sickness has been newly diagnosed as sleep apnea, for which the doctors prescribe breathing air under slight pressure while asleep. This has begun to restore **Marion's** pre-illness personality, but she still requires 16 hours or more of sleep. Additional treatment seems indicated. Besides caring for **Marion**, **Gilbert** works with flower arrangements, which he puts on public display.

Stan Proctor sent out an interesting card showing an MIT drafting room of the 1890s. The formally coated and tied male students are bending over their slide rules, but the interpolated 1990s coed flaunts her MIT sweat shirt and has a desk top computer. Is **Stan** celebrating 100 years of the Alumni/ae Fund? Whatever, he says that on December 31 our class was 63 percent ahead of 1994. . . . Thanks for the news. Keep it coming.—**Bob Rorschach**, secretary, 4727 S. Lewis Pl., Tulsa, OK 74105-5138

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Caspar C. Schneider, Jr., has joined the New York office of Fish & Richardson, P.C. **Caspar** earned a law degree from Fordham University and practices patent litigation and

patent prosecution with a concentration in chemistry. Fish & Richardson is a national law firm focusing on intellectual property and technology with 125 lawyers in seven offices throughout the country. . . . **Paul Heilman** and **Maudi** traveled to California for 3 weeks visiting their son in San Mateo and then on to Carmel to see **Mary and Waite Stephenson**, '45. The 50th Reunions of both '44 and '45 were compared. No conclusions were drawn as to which was better, but the continuing bridge game during the discussions was heated.

Andrew R. Buccini passed away on April 2, 1995, in Richmond, Va. He is survived by his wife, **Mary**, a daughter, and three grandchildren. **Andy** was a native of New Britain,

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Conn., and graduated in the V-12 program. After naval service in WWII, he had a lifelong career in the bakery machinery industry. . . . William T. Seales, MD, passed away in Hopkinton, N.H., on June 19, 1995. He is survived by his wife, Elizabeth. I have no further details.

Samuel G. Morrison sends word that his wife, Betty, passed away on November 29, 1995, after a long battle with cancer. Betty had been a secretary in the Course XIII office while Sam was a post-war grad student. She felt very much a part of the MIT family and always looked forward to reunions and especially Tech Night at the Pops. . . . Peter D. Matthews also reports the loss of his wife, Diane, who passed away in June 1995. She was a pastor at the Blue Hill Community Church in Readville, Mass., and a past chairwoman of the Needham Housing Authority among many community service activities. The Housing Authority has named a special needs house, the Matthews House, on Great Plain Avenue, in her memory. Peter and Diane dated while he was an undergraduate and were married in 1947. The class extends its deepest sympathy to the families of our departed classmates and wives.

Robert Bartz sends word from Claremont, Calif., of the upcoming publication of his book, *Timeless Strategy*, by the Corporation for Society of which Bob is chairman. The Corporation for Society is instituting a national dialogue in spring 1996 on major questions facing American society. The themes are: a redefinition of bipartisanship in American politics, prioritizing the nation's discretionary monetary and human effort, coupling higher education reform and academic attention to societal problems through grants awarded from a corporate fund, statement and questions for society (a first) from the Youth Training School, and organization ethics, a proven strategy. Each of the topics will be explored by a leading authority. The Corporation for Society was founded in 1981 by Robert Bartz and Norman Cousins to develop a strategy for continuous adaptation to change. The result, defined as a Learning Society, reduced the strategy to information and communication, and was successfully applied in widely different contexts. Pervasive application is now planned to begin also in the spring 1996. Application abroad in selected countries will also begin then as a new and cost-free dimension of foreign outreach. Over time, the Corporation is expected to represent the private sector quite broadly, in a structured way. For more detailed information on the book and the programs, write to Robert Bartz at The Corporation for Society, 781 West Seventh St., Claremont, CA 91711.

By now, those of you who attended the 50th Reunion should have received information on the planned mini-reunion to be held October 6-9, 1996, at the Harborview Hotel in Edgartown, Martha's Vineyard, Mass., and indicated your intentions on the return stamped card. Any classmate who did not attend the 50th and would like information on this mini-reunion, please write or call Norm Sebell, reunion chairman, or one of the secretaries. Time marches on and our numbers decrease, so don't put off this opportunity to share the joys of the past with your caring classmates.—Co-secretaries: Louis R. Demarkles, 77 Circuit Ave., Hyannis, MA 02601; Frank K. Chin, 221 St. Paul St., Brookline, MA 02146

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Frank Gallagher never slows down! To quote from a Christmas note, "In September backpacked with three other old men (MIT Theta Xi) in Nova Scotia, 5-12 miles a

day plus buses and cabs. Jim Critchlow, the only one who had ever backpacked, was our guide and facilitator. Over the 10 days, we met some great people in both the French and English cultures. Canadian immigration inquired as to whether we four white-haired guys were looking for work. Along that theme, we were refused by roofers and carpenters, but one chap in Lunenburg said we could find work in Halifax—if we were prostitutes! One the ferry back to Portland, Maine, I was able to recover some of the expenses at the blackjack table, having been watched by a gal on my right who said she was a dealer at Foxwoods in Connecticut!"

What a letter! I should add that Frank forwarded some great photos, particularly one of J.J. Strnad enjoying our reunion (sound asleep sitting by the pool at Black Point Inn). . . . Jan and Charlie Patterson's Christmas message was most appropriate: "Have a 'well' winter!" . . . Elaine and Bill Sherman are still holding the fort in Damariscotta, Maine. . . . Particularly enjoyed Mary Trageser's note: "I'm staying home for a while; had a nice fall trip to Tuscany but must have a London fix this spring."

The Nick Mumfords continue to break the class's grandchild record—17th granddaughter and 26th grandchild—Caroline Peterson, in March 1995. Following reunion, Carol and Nick visited Hawaii with Nick's daughter, Ayliffe, serving as travel arranger and guide extraordinaire of this 12-day safari. Nick continues to work for the local diocese of the Episcopal church with budgets and fund-raising. J.J. (excuse me, Budd) Strnad's Christmas note in many ways said it all: "After our 50th, Edna and I spent a week at Martha's Vineyard followed in the fall by a visit to the Canadian Rockies, Vancouver, and a few days in Los Angeles with son Jeff and family. Christmas was spent in South Eleuthera, Bahamas—white beaches, not white snow."

Julian Busby's son, George (named for a deceased classmate, George Hetrick) is restoring a home in Natzhez while commuting to the South China Seas for, I believe, Esso; son Jeff plays with an antique shop. . . . Katy and Jack Freiburger's Christmas card was a great photo of them both taken at a "Great Gatsby" charity benefit. Jake looked far better in his tuxedo than he ever did in bell-bottoms! The Freibergers continue to divide their time between Dallas, the Abacos, and Durango.

Jimmie and Tom Stephenson divide their time between Naples, Fla., and Knoxville, Tenn., where they were born and bred. Tom's new knees have helped him bring his golf handicaps back down, and their expanded apartment in Knoxville allows Jimmie to double the size of her award-winning garden. . . . The Christmas mails brought a sweet note from Max Ruehmund's widow, Trudy, who is slowly making the adjustment. Fran and I can remember them as newlyweds some 40+ years ago as we lived in the same garden apartment complex in White Plains—\$103 per month, and we all thought the rent was excessive!

Many of our local friends and neighbors accuse us of excessive activity and travel, but after reading Jean and Chris Boland's Christmas letter, I have concluded we are homebodies! I hesitate to add up the days the Bolands spent on the road in '95—Florida, the Carolinas, Pennsylvania, New Orleans, Reunion, the *Delta Queen* on the upper Mississippi, Yorkshire, London, Cincinnati—and, of yes, home in Stamford, Conn.!

A special note from Mary Hoaglund brings us up to date on her family as well as her new family, as she enjoys her new life as Mrs. Blair Vedder. Mary refers to their June '95 wedding as the Vedder-Hoaglund merger!

Since writing the above at Christmas time, we have learned of the death of **Connie Cross Robbins** of North Aurora, Ill., on July 8, 1995; no details. Connie is survived by her husband, Roger, and, as I recall, one child.—**Clinton H. Springer**, secretary, P.O. Box 288, New Castle, NH 03854

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50th Reunion

Bob Hoffman has been very active as our 50th Reunion chairman. Class members

should have received letters from him concerning the 50th Reunion schedule, including June 6–8 campus events and June 9–12 events in Newport, R.I. Over the years, we have, unfortunately, had many deaths of class members. We are trying to encourage surviving spouses to attend our 50th Reunion events.

John Maynard and **Dan Cooper** are putting the finishing touches on the 50th Reunion Yearbook. By early February 1996, they had received 184 biographies from class members. . . . Under the chairmanship of **Ted Heuchling**, the 50th Reunion Gift Committee has already raised \$3.5 million. They recently increased the gift goal to \$4 million. MIT has received combined gifts from two class members exceeding \$1.6 million. The gift committee had a meeting in late January 1996 at **Roger Sonnabend's** Sonesta Beach Hotel in Key Biscayne, Fla. Ten class members and four wives attended including: **Barbara** and **Rick Adler**, **Ernie Buckman**, **Ken Davis**, **Phyllis** and **Glen Dorflinger**, **Win Hayward**, **Patsy** and **Ted Heuchling**, **Bates Lea**, **Roger Sonnabend**, **Dick Steele**, and **Jane** and **Chuck Wellard**.

Al Little has received a significant commendation from the National Reconnaissance Office for his leadership and vision for the development and production of our nation's first space reconnaissance satellites. Much of this work was done up to 35 years ago and was highly secret until recently. Al's wife, **Marian**, died in 1993. He has recently been quite involved with archaeological digs. . . . **Bill Schield** has been working time and a half in stock brokerage and investment counseling for 37 years. He is thinking about slowing down. He looks forward to our reunion. . . . In the January 1996 *Review*, there was a full-page picture of **Nancy** and **John Taylor** of Baltimore, Md. They are supporters of the MIT Life Income Fund. Since John retired from the Westinghouse Corp.; he and Nancy have participated in several Elderhostel travel and study programs.—**Edwin H. Tebbetts**, secretary, 9 Jerusalem Road Dr., Cohasset, MA 02025

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We like the first paragraph from a recent story in the *Boston Globe*: "At first, **Walter Kern** appears to be just another resident going for a drive as he enters the underground parking garage at Canton's Orchard Cove retirement community. But while his neighbors have mammoth Lincolns, Cadillacs, and Oldsmobiles for such purposes, the 78-year-old engineer prefers a vehicle he can plug in when not using—the tiny Saab Sonett III sports car he has restored and converted to electric power."

Walter became interested in electric cars in 1991 and bought the "banged up" Sonett then. He restored it and converted it to electric power by mid 1992. The car runs on 14 batteries and has a range of 60 miles at 50 miles per hour—unless it is cold or there are too many hills involved! **Walter** uses it to commute the 42-mile round-trip from his home in Canton to Boston. He is chief mechanical engineer at Teradyne, Inc.

Start thinking about this time next year—our 50th Reunion is in June 1997. Has it really been that long?! Make your plans to be there—you'll get details in plenty of time.—**R.E. "Bob" McBride**, secretary, 1511 E. Northcrest Dr., Highlands Ranch, CO 80126

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Plans for the campus portion of our 50th Reunion revolve around the MIT Graduation Ceremony, Technology Day, and Tech Night at the Pops.

Our class will be invited to President's Vest house for a reception, and one evening we will have a dinner for members of our class. Our class is invited to lead the procession at the MIT Graduation, Friday morning, June 5, 1998. On Friday afternoon, we will plan activities for our class as the highlight of our 50th Reunion. The afternoon activities will include a reception at the President's House. Friday's activities combined with MIT Night at the Pops on Thursday, June 4, and Technology Day on Saturday, June 6, will be the campus-based portion of 50th Reunion.

Denny McNear, **Sarah Gunter** (Alumni/ae Association staff), and I had lunch with two students who receive funding from the Class of 1948 Student Financial Aid Fund. **Anthony Ives** is a senior from Waterloo, Iowa, majors in urban studies and planning, and has achieved a cumulative grade point average of 4.9 (out of 5). **Anthony** plays on the varsity football team, is active in Lambda Chi Alpha fraternity (president, rush chair), and volunteers in Cambridge public schools. He is one of three students on the 15-member committee for Student Services Reengineering. The committee is considering on-line procedures for handling registration, payments to the bursar, and other student services.

Christine Chan, '98, of Oakville, Ontario, majors in EE and computer science. Her career objective: "To be an entrepreneur and a consulting engineer in design and manufacturing electro-mechanical products." She is advertising manager of *The Tech* and has her own show on MIT's radio station. She has her amateur radio license and is working on a radio engineer license. She plays intramural sports and the piano. Our lunch was a lively

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discussion keeping up with the activities of these two students. Anthony showed excellent insight when we talked about the pace of their lives. He suggested stress is good until the stress reaches a point of being harmful. Christine had never heard the expression that MIT is a factory. Denny described a trip to Switzerland where he and his wife, Babs, spent two weeks hiking in the Alps with three friends. Blue skies, beautiful fall foliage, and musical ringing of cow bells and church bells was exhilarating. Grindelwald was one three bases for their hiking, and they had beautiful clear views of Jungfrau and the Matterhorn. They also spent a week alone (honeymoon) in Lucerne and Locarno. . . . **Russ Lawton** invites us to Sonoma, Calif., in June. They will celebrate the 150th anniversary of the Bear Flag Revolt when American settlers took down the Mexican flag and founded the California Republic. Three weeks later the American Navy in Monterey declared California a territory of the U.S. . . . **Robert Devine** sent me his comments about free trade among countries—he is opposed to free trade.

Mitchell Silverstein died in Florida in August. **Don Noble** and **Mitch** were roommates in the Senior House (Atkinson 203, Don guesses) during their senior year. **Harold Otobrin** and **Denny Allegritti** were roommates in an adjacent room. Don sent some notes about his longtime friend and classmate. Don spoke to Mitch's wife, Hope, and she told him that Mitch suffered a serious stroke aboard their yacht on the east coast of Florida. They were on a cruise at the time with other boats from their yacht club in Naples, Fla., where they have lived since 1984. Mitch was the retired president and CEO of Specialloy, Inc., in Chicago. Specialloy made special alloys to be incorporated with other metals to satisfy a specific purpose, such as valve seats. Mitch was a professor at Illinois Institute of Technology and was active in several trade and professional societies. Mitch and Hope (Gordon) were married in the early '50s. Don remembers flying to Chicago for the wedding and stopping at Mitch's plant close by the old Chicago Airport and seeing the huge furnaces used to make the alloys. Mitch, during his trips to Boston, would visit Don and Nancy and also **Jack Rizika**. Don writes: "A memorable visit in 1970 will always be with me, as Hope, Mitch, and their five children visited us at our home in Hingham, Mass. The kids were all of similar age as our six, and we had a joyous time all together. Mitch had a way of bringing joy into any encounter he had with people he cared for. He had the capacity to make you feel that you really mattered, always making cogent, helpful comments to what was said. This caring involvement with friends was a unique, albeit rare, quality and is one the most powerful memories Nancy and I have of him." Hope writes: "Mitchell liked traveling, yearly visits to Israel and Europe. Always enjoyed each day to the fullest; a loyal friend. He enjoyed boating, liked to navigate on our trips. He was still active and involved in the metal industry and not retired." On behalf of our classmates, I extend our sympathy to Hope and her family. Relatives of Mitch and of **Bachman Wong** (obituary in February '96 Class Notes) have made gifts to the Alumni/ae Fund in memory of their loved ones. These are the first reports to me about this practice, and I find this a wonderful way to provide a con-

tinuing memory of someone who has died.

Norm Kreisman suggested again that its time for notes about myself. My fourth career is starting to produce significant weekly income, although it is premature to think it will continue for a year. In 1990, my third career, as a manufacturer's rep for vacuum chambers and equipment used to deposit circuits on silicon substrates, ended, when the franchised rep replaced me with his two sons. I still service filter customers (developed in 1980-84) for about three-to-five hours a week and receive generous commissions. Since 1990, I have had six jobs contracting database services on the Macintosh and PC computers. Initially earnings were at \$7/hr., but now I earn \$45/hr. Setting up databases with forms, macros, and reports is a fun activity for me, and I feel I am being paid to play. In addition, the latest client manufactures and sells toys for ages 3-99, and everyone is play oriented. My first career was product development including: the polyglas tire (1958) at Owens Corning Fiberglas and several products for Fram. My second career, in manufacturing, began at Fram in 1974 and before leaving Fram I equipped a new plant in Salt Lake City with two ovens and related equipment. In 1978, I joined Globe Manufacturing making Spandex, which is used to hold up panty hose. Globe hired me to pick my brains for improving manufacturing efficiency (one project saved \$1 million annually) and fired me after two years to bring in a chap with different experience. Haven't been back to Nepal since 1985 but for 10 consecutive years, I have spent three days at Mount Washington in New Hampshire during the New Year's holiday period. I hike up 1,800 feet, have lunch, and come down. The views are fantastic—sometimes. The weather varies, with -40°F wind chill on two trips and wet snow on two trips, but otherwise mild and beautiful. After three days of hiking, I have had no aches, no cramps, no shortness of breath, and my pulse stays below 100. Conclusion, I am a lucky guy.

Please send news to: **Marty Billett**, secretary; 16 Greenwood Ave., Barrington, RI 02806; tel: (401) 245-8963.

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Mike Scholnick continues to work in his sales representative business where he has freedom to travel courtesy of a partner who minds the store when Mike is gone.

Your secretary is the victim of a two-year scam. Two years ago, **Ken Prytherch** told me on the phone that he was off to Ethiopia but hung up before I could ask what for. A year or so ago, I asked in this column: "What were you doing in Ethiopia?" Back came a color photo, postmarked Tanzania, of a late model Cadillac bearing the plate number MIT49. Said Ken: "You asked what I was doing in Ethiopia. The same reason I am writing from Tanzania. I'm trying to find the owner of this car and why he is driving it in Africa." That was a year ago. Now comes the answer: Ken is a birder and was looking for birds.

Mae and **Al Kenrick** write about a trip they made to Kazakhstan and Russia with their daughter, Jane Lutter, PhD, who has been on a public health project there and who helped them gain a better understanding of that part of the world. Says Al about visiting Russia in

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winter: "It's great. No tourists, no lines at the Hermitage, circus, Kremlin, or the ski slope of Chimbulak, one of the premiere winter sport areas in the old USSR. We even learned how to get around Moscow on their clean and efficient metro."

Because of the alphabetic seating in our day, **Earl Eames** and I sat side by side in many freshman classes. Logic says somebody must have been sitting on the other side of one of us, and the rule was that one out of the three of us would flunk out before the end of our freshman year. Who was that guy? We don't remember. Out of the 168 hours allotted to us each week, Earl manages to teach full-time at two colleges as an adjunct professor at Augsburg College and in the Graduate School of Business at the University of St. Thomas, teaching international political economy and international management. Earl's four accomplished children and seven grandchildren keep him on the road a lot. Seven years ago, Earl had a heart bypass operation. That makes two of us and I keep hearing of others. Earl and I, by the way, are doing well.

George Loomis believes that his is a typical family and finds that retirement has the following characteristics, among others—grandchildren; travel plus maintaining a house in Tucson; sudden quiet with no crowd around. . . . **Axel Kaufmann** says he is now retired on Fridays. Monday through Thursday, he represents the A/E Design Team during construction of Boston's new federal courthouse on Fan Pier, slated for 1998 completion.

Parker Painter died June 19, 1993, according to a mail return from his home in Ocala, Fla. I feel badly that this news has been so slow in arriving. And, as is too often the case, there is no further information on Mr. Painter. . . . **Joseph Michael Lynch** died on October 15, 1995. Before retiring, Mr. Lynch had been affiliated with the University of California Medical Center in Santa Monica, Calif. I used to know Joe and greatly miss the lack of any further information. . . . U.S. Navy Captain **Kenneth J. Cole** died on September 23, 1995. I regret the lack of further information on Captain Cole.—**Fletcher Eaton**, secretary, 42 Perry Dr., Needham, MA 02192; tel: (617) 449-1614

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I thought it might be time for a secretary's report. This is my 19th column. In those, I have mentioned 150 classmates. Class President **Bob Mann** has appeared the most times. Other than class officers, three entries is the most and three is also the number of such classmates. I can report one scoop in spite of hav-

ing to submit my column three months before publication. The scoop concerns **John Holland**, who was the subject of over 39 column-inches in the December 26 *New York Times*. Before the *Times* reported that he got the telephone call about the MacArthur genius award while in the shower, you read it here first (TR of January 1996, which was mailed before Christmas). You also learned here (but not in the *Times*) that Murray Gell-Mann, PhD '51, placed the call. That is all the bragging I am allowed, so on to other news.

I reached **Virginia Stevens Small** at her home in Oak Harbor, Wash., where she lives with her retired Naval aviator husband. Ginny left MIT with a degree in architecture and worked for a Public Works Department for a few years. When she married Rufe she decided the frequent moves made work outside the home impractical. She reared a girl and three boys who have accumulated two PhDs, an MA, and a BA (who flies for Delta). Ginny designed a house for one of her boys and her own house that overlooks the water and the Olympic mountains. She and Rufe enjoy golf, and Ginny enjoyed a trip to Australia and New Zealand five years ago and a tour of

three years ago and is now a Naples, Fla., resident. He recently revised his resume for the group that assigns arbiters and sent me a copy. He hears from **Vito Piccirillo** who spends his winters in Vero Beach, Fla. Joe has traveled widely. Among other trips, he went to Australia with his daughter to visit a relative in Perth. They traveled from Sydney to Perth on the transcontinental Indian Pacific Railroad. At a seminar in Vancouver, he saw **Al Petrofsky**. I was impressed that of his seven children, Joe persuaded six of them to join his firm, which they now run. That leaves Joe free to enjoy his arbitrations, golf, fishing, and his 18 grandchildren.

Your reunion committee met for a "post-mortem" in January. We decided to attempt what other classes do often—a mini-reunion between now and our 50th in 2000. **Bob Cesari** accepted the chair of the mini-reunion committee. Mark your calendar for sometime early in 1998. Further details later. Anent the 45th Reunion, we have a limited number of the souvenirs left over. It is a baseball cap in MIT colors—silver gray with a cardinal red peak. The logo on the front is a cheerful cartoon beaver waving a pennant, "M.I.T." to its right and "50" to its left (see photo at left). If any one wants one, send \$18 (which includes S&H) to **Mal Green** at 14 Pickwick Ln., Wayland, MA 01778.

There is sad news of four classmates to relate. **Francis Shannahan** died January 6, 1995. He lived in Medford Lakes, N.J. Frank was our class president sophomore year, according to my *Technique*. He is survived by his wife Mary. . . . **Raymond Blair** died May 25 in Easton, Pa. He had been editor-in-chief at the Graphic Arts Technical Foundation in Pittsburgh before he retired in 1984. Ray is survived by his wife, Mary. . . . **James Ballou** died August 3 in Salem, Mass. James joined us for junior and senior year and his picture is in the 1950 *Technique*. James went on to graduate with his five-year architecture degree in 1951. He served in Europe during WWII, and after MIT he practiced in Salem. He received many awards including the first Bullfinch Award for his work on the USS *Constitution* Museum at Charlestown Navy Yard in Boston. James is survived by his wife, Phyllis. . . . **Philip Dumka** died last August 4. He lived in Carlisle, Mass. . . . **Daniel**

Lundgren died November 13. He lived in Madison, Ala., and is survived by his wife, Janet.—**Robert A. Snedeker**, secretary; Seven Mashie Way, North Reading, MA 01864; tel: (508) 664-1738; e-mail: <103244.1541@compuserve.com>

51 45th Reunion

We are in for a treat at the Friday evening banquet planned for our reunion in June. We were fortunate to obtain Dr. Robert Rose, the director of the Concourse Program at MIT, as our speaker for that evening. As soon as you meet him, you'll see from the twinkle in his eyes why he is much more comfortable being called Bob.

ClassNotes

The Concourse Program is one of the most rewarding areas supported by our Class of 1951 Fund for Excellence. About 25 years old, Concourse establishes a unique learning environment for the 60 freshman who volunteer to enter it each year. These students take their core freshman courses together: They work in groups as an approach to coping with MIT, and have their own lounge where they discuss assignments. Taught by a small and dedicated staff, the students work closely with their teachers.

Bob Rose, the director, was one of the youngest tenured professors in MIT history. He is one of those classically warm and dedicated teachers who relishes the opportunity teaching provides to enrich young lives. Bob invited me to some Concourse sessions. He has a unique lecturing quality and presents the material thoroughly and interestingly, quickly bringing the students into the lecture and then into dialogue. They question and explore points where they feel uncomfortable. Our Class Fund support has enabled Bob to provide Concourse with an innovative addition that addresses problem solving in contrast to learning facts. He will be talking about this at our reunion banquet. We can look forward to what will be a stimulating and enjoyable addition to our evening.

For the past seven years, **Art Wasserman** has been the associate dean and chair of the Business and Management Division of Cardinal Stritch College in Milwaukee. His wife, Sheila, graduated from Marquette Law School two years ago and is practicing in public defender and family-court work. Their son Robert and his wife, Joanne, have a successful desktop publishing business. Their other son, James, was married last summer at the Stritch College chapel. Both are in the financial services industry.

Those of us fortunate enough to attend Technology Day last year saw a flyby of WWII vintage airplanes over the Charles River and Cambridge. The arrangements for this were made by **Carleton Walker** who also assembled the handout on MIT Contributions to the War in the Air. This gave Carleton the opportunity to renew his many Course XVI friendships. His only regret was that he was unable to schedule his old B-24 for the flyby. He is currently enjoying retirement from Arthur D. Little where he worked for 20 years. He also worked for Allied Research and Stone & Webster in both New York City and The Netherlands. He is filling his time with travel, fly fishing, and golf. He and his wife, Lucy, also spend time with their grandchildren that live close by. He does miss the soaring that he was able to do over the past 20 years both here and in Europe.

Still living in Columbia, Md., **Lawrence Kuszmaul** is now retired. Recently, **Al Gwynne** and his wife, Bobbie, paid him a visit on their way to South Carolina. Al is also retired and plays a good deal of golf and tennis.

The sad news of **Fred Lehmann's** passing appeared in last month's Class Notes. I received this additional material from the Columbia-Presbyterian Medical Center where



Boston Pops Conductor Keith Lockhart models the Class of '50 Reunion hat (see column for info).

Europe earlier. Ginny hears from her fellow architects **Doug Strong** and **Bob Pils**. Ginny was a Wave in World War II and then commuted to Tech from West Andover. Having lived in Andover myself, I guess that she commuted the farthest. If any alumnus or alumna of the 5:15 Club can claim a greater distance, please tell me. I shall be glad to transfer the class title.

When contractors bid major contracts they realize that at the completion there might be some disagreements. Thus there usually is an arbitration clause using one or three arbiters experienced in such affairs. **Joe D'Annunzio** is such an arbiter now after a career creating a major contracting firm in New Jersey. In 1982 he was cited as Engineer of the Year by the New Jersey Society of Professional Engineers and in 1995 he was inducted into the New Jersey Construction Hall of Fame. Joe retired

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Technology Specialists
Thomas E. Anderson
David W. Rouille

Fred was working and am including it here. "Fred Lehmann, the deputy VP for development at Columbia University's Health Sciences Division, was 65 when he died after a long battle with cancer. He was a pioneer in modern development strategies for universities. Since 1989 he created and conducted programs that attracted considerable financial support for the Health Sciences Division at Columbia. Under his direction, resources increased from \$28 million to \$48 million annually. Fred began his career in advancement with the Alumni Association at MIT where he had graduated as a chemical engineer. He was responsible for having their annual giving program grow from \$2.5 million to \$4 million during the 1960s and 1970s. He also directed development programs at New York Medical College, Rockefeller University, and Boston University. He was a member of the 'Unnamed Society,' New York Academy of Sciences, the Group on Institutional Advancement of the Association of American Medical Colleges, Harvard Club of New York City, and the Association for the Advancement of Science. He is survived by four children. A memorial service was conducted at the Columbia-Presbyterian Medical Center in January."—**Martin N. Greenfield**, secretary, 25 Darrell Dr., Randolph, MA 02368; e-mail: <Greenfld@tiac.net>

52 Edward Dickerman died September 13, 1994, after a heroic battle with Parkinson's disease, reports his wife, Fawn. She writes that he had worked as a metallurgist for National Lead Corp., Vanadium Corp. of America, and 16 years for the Colorado School of Mines Research Institute in Golden, Colo. They had later moved to Salt Lake City to be near their children. She says, "He loved life, his friends, family, and lived to the fullest." He is also survived by two stepsons, a stepdaughter, and a sister.

Herbert H. Dow died January 26, 1996, in Houston from complications following heart surgery. He was a member of the MIT Corporation, and has served on many visiting committees overseeing various MIT departments. He worked for 40 years for Dow Chemical, founded by his grandfather, serving on its board of directors for 39 years starting in 1953. At the time of his death he was president of the Herbert H. and Grace A. Dow Foundation, named after his grandparents, which has given grants to educational, art, and medical institutions.

Richard Lyle died November 12, 1995. He was a longtime employee of Chevron. I have no further information about him at this time. **Nick Haritatos**, another Chevron veteran, thoughtfully sent along the unhappy news. In his letter, Nick says that although he turns 65 this spring, he has no current plans to retire. He is enjoying his work, and business is booming. But news of Dick's death made him stop and think that maybe he had better retire while he still had his health.

Mike Goldman writes that since the death of his wife, Dorothy, last December, he has been working to rebuild his network of old friends, especially his MIT fraternity brethren. He made a trip from Phoenix to Las Vegas for the opportunity to visit with **Dave Weiss** who

was in town for a conference. He plans to attend our mini-reunion in Hershey for the opportunity to see old friends, and "to kill or cure any nostalgia for the Northeast." Mike continues to work as a project manager at Bull Information Systems in Phoenix, and he, too, would like to continue working past 65. He has two daughters living in Denver, and one in San Pedro, Calif.

Clifford Morse has retired after 45 years of architectural and planning practice "on three continents, and various islands." He is writing a scientific paper on archeo-astronomical building orientations in Teotihuacan, Mexico, the largest and oldest city in ruins in North America. He hopes it will lead to a textbook on the principles of building orientation.

The Alumni/ae Association has written to Class President **Bob Lurie** to inform us that **Christian Anderson** of Cody, Wyo., is once again the beneficiary of the Class of 1952 Scholarship Fund. Christian continues to study aeronautical engineering, has a 4.8 cum, and a wide variety of interests: weightlifting, ice and in-line skating, hockey, mountain biking, tennis, sports and racing cars, high-performance aircraft, aviation, and photography. He is also a leadership member of the United Christian Fellowship. During the summer he is self-employed, tying and selling fishing flies. We are again reminded that it is our support of scholarship funding that makes aid for deserving students like Christian possible.—**Richard F. Lacey**, secretary, 2340 Cowper St., Palo Alto, CA 94301; e-mail: <rlacey52@aol.com>; <mit1952@mitvma.mit.edu>

53 E. Richard "Dick" Hilton writes that he is the proud father of Kimberly, now 6 years old. His two older daughters have yet to produce grandchildren, so he decided to make his own! Dick worked for a "highly sensitive" government agency that sent him all over the world. After early retirement, he managed to fit in stints at Lockheed, Ford Aerospace, Jet Propulsion Lab, and TRW. He is now a computer systems consultant, specializing in system security, and lives in San Mateo, Calif. . . . **Alan Owens** is still CEO and chairman of the board of Arizona Refrigeration Supplies, but plans to retire in August 1996. He lives in Sun Lakes, Ariz. . . . **Morton J. Friedenthal** retired three years ago and keeps busy with golf, fishing, and home maintenance. He is also a docent at the Museum of Flying in Santa Monica, Calif., and still does some consulting to keep his technical brain active. . . . **Martin Turkanis** is involved in extensive travel in connection with the international marketing of Neutron Products' teletherapy equipment. He and Elinor live in Rockville, Md., and



*Kimberly Hilton,
Class of 2010*

enjoy three grandsons, two of whom arrived just last year. For 22 years, they camped nearly every available weekend at an idyllic waterfront site nearby, which has now been lost to them. The grandsons would have loved it!

Finally, **Sid Hess** and **Fred Brecher** are exploring dates in October or early November for a mini-reunion in Bermuda. If any of you are interested or have any comments, Sid and Fred would be happy for you to contact either one of them directly. Please let me hear from you.—**Joe Cahn**, secretary, 20 Ocean Park Blvd., #9, Santa Monica, CA 90405; tel: (310)-396-6322 or (310)-201-7405; e-mail: <jmc20@aol.com>

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After reporting **Ray Rivero's** year of travel and "smelling the roses" in our last column, I received a note from Ray stating that his planned Caribbean cruise last November had been canceled. On November 20, he had open heart surgery in which some six parts of his arteries were bypassed. But the prognosis is very good, and Ray says that he's feeling great. . . . **Paul Spreiregen** writes that, as he was writing out his end-of-the-year contribution check to MIT, he decided to pass on some personal news for the class. (Please take note, all of you!) As you may recall, Paul has been a very successful architect and planner in Washington, D.C., since the early 1960s. In 1980, he organized the design competition for the Vietnam Veterans Memorial, with outstanding results. So he has now been asked to play the same role (competition professional advisor) in a design competition for a memorial for the victims of last year's bombing of the federal office building in Oklahoma City. Paul notes that he left Boston around 1960 because after working on a most ambitious plan for what is now the Boston Government Center but was then Scollay Square, he felt that nothing would ever be done with the plan and decided to seek more sympathetic environs. His original plan was subsequently modified considerably, and ultimately a version by I.M. Pei was used. Now, Paul says, there is much talk about changing part of the complex to bring it closer to what he and his colleagues had originally proposed.

Dick Morley, who has more companies to run than most of us have grandchildren, operates RMI (R. Morley, Inc.) out of Milford, N.H., among all the others. In April, RMI sponsored the fourth annual conference on chaos in manufacturing in Santa Fe. . . . Word has been received that **Seymour Grossman** has retired from his position as chief of Gastroenterology at the Kaiser Permanente Medical Center in Oakland, Calif., and is now a full-time undergraduate student in the School of Music at California State University/Hayward. . . . **Elaine** and **Roger Griffin's** annual holiday family report says that 1995 was a terrific year. Rog has not retired, much to Elaine's relief, apparently. Like most of us, however, the Griffins find time to travel, leaving Maryland for Panama and Acapulco last winter, Ireland and Great Britain in June, and the Caribbean this past February. And they find time, of course, for their grandchildren who number five, I think—I may have missed one or two while counting names in the letter.

Crathern J. Schwenk, the feline correspon-

dent for Catherine and **George Schwenk** also provided the annual year-end report on the Schwenk household. (The "J" in the cat's name is new, I believe.) Last June, the Schwenks attended the Inc. 500 conference in Norfolk, Va., where George was made an honorary member of the Inc. Hall of Fame in recognition of his having been associated with six Inc. 500 companies. George also attended his 45th high school class reunion (I suppose that a lot of us did that) but otherwise had a quiet year. According to the cat, he got involved with some new companies, but did not get out of any—"that is, none went belly-up and none were sold."—**Edwin G. Eigel, Jr.**, secretary, 33 Pepperbush Ln., Fairfield, CT 06430

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William Deibel and his partner sold their GMC-Volvo truck dealership in Seattle in April 1995. However, Bill was not able to stay away and now is selling for the new

owner on a less than full-time basis. He reports that he is glad to be relieved of a lot of stress. Bill is a collector and restorer of vintage cars. At reunion time, he had 12 ranging in age from 1920 to 1979, including two he bought during his undergraduate days. He is a 41-year member of the Classic Car Club of America, and has served on the regional board of managers and is a past regional director.

Joseph Carleton is still consulting in forensic mechanical engineering—accident investigation and reconstruction. He says that seeing personal disasters sometimes makes him afraid to get out of bed in the morning. But on a happier note, he and Ruth spent two wonderful weeks traveling all over Japan by rail last year—after the Kobe earthquake and before the Aum Shinriko gas attack. They found the people and country fascinating. They also drove and hiked in Glacier Park, the Canadian Rockies, and the Olympic Peninsula for three weeks. Previously, they had taken Elderhostel trips to Scandinavia and to France. Joe reports that, like any piece of aging machinery, they have the usual mechanical problems, but that they are surviving. . . . **William O'Neil** is enjoying retirement. He sailed across the Atlantic Ocean in a 44-foot sailboat! . . . We regret to report the death of **Paul Chestna** on August 24, 1995. Paul was a resident of Shrewsbury, Mass. He is survived by his son, Peter.—Co-secretaries: **Roy M. Salzman**, P.O. Box 197, Rockport, ME 04856-1097; **James H. Eacker**, 3619 Folly Quarter Rd., Ellicott City, MD 21042

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40th Reunion

Roger Borovy has joined Fish & Richardson, an old-line Boston intellectual property

law firm. He is in the Menlo Park, Calif., office doing patent infringement defense and licensing. The Fish firm wrote the patents for Thomas Edison.

Arnold Schindler attended the 40th Reunion planning session last February 6 and reports that he has retired from Northrop Corp. His son David graduated from Brandeis and is the Events Producer for the Capital Center in

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Washington, D.C., where the Bullets and Capitals play.

Please send news to: **Ralph A. Kohl**, co-secretary; 54 Bound Brook Rd., Newton, MA 02161; e-mail: <kohl@ll.mit.edu>

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Please send news for this column to:

John Christian, secretary
7 Union Wharf
Boston, MA 02109

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John Boynton sends word from South Houston, Tex., that his second go at a family has created some unique situations, such as buying a senior, an adult, and two child tickets

when they go to the movies. He is playing Mr. Mom while wife Laura is finishing a PhD in biochemistry from Rice University. Laura, or Zhuang Luo, was born and raised in People's Republic of China. Their daughters, ages 2 and 4, know "everything" so John has plenty to do!

Meanwhile John is restructuring his career, which involves consulting engineering and psychotherapy, an intriguing combination. In his spare time he is working on a Mustang II homebuilt aircraft. He hopes that by the time this is published (being written in December) they will have achieved their objective of Laura finding a position which relocates them to the New England area.

During 1994-95 **Jason Taylor** returned to the Institute, this time at the front of the classroom, where he taught seniors and graduate students scientific and technical writing as an adjunct member of the Department of Writing and Humanistic Studies. Recently he also applied his writing talents to producing and publishing the biography of a holocaust survivor entitled, *I Kept My Promise*. Oldest son Mike is a videographer/editor at a Boston TV station, and has already won 15 Emmies. Middle son Jim is an architect in New York City, listing Madonna and Mary Tyler Moore among his clients, while youngest son Dan is a contractor in the Boston area.

Paul Larson has been appointed VP of DuPont Asia-Pacific operations. He is also the managing director of DuPont Singapore. In addition to an SB in chemical engineering, Paul also holds master's and PhD degrees from the University of Delaware. . . . **Arthur Aronson** has been elected to the Cooper Tire and Rubber Co. board of directors for a term expiring in 1998. He also continues as president and chief executive officer of Allegheny Ludlum Corp. (for full details see report in the January '95 *Technology Review*).

From the department of second-hand information: **Steve Dorsey** was spotted by Class President **Mike Brose** last fall in the Detroit airport. Steve's venture, Voice and Data Systems Ltd. in Montreal, is growing in both the U.S. and Canadian markets. Meanwhile Class Treasurer **Al Russell** visited **Bob Schmidt** and reports that Bob, now a senior Fellow with

Boeing, has a spectacular view of downtown Seattle from his home, all the more enjoyable when sipping one of Bob's fabulous margaritas!

Classmates can now reach me from Cyberspace as well as by conventional mail. Please send your news to me —Gary Fallick, secretary, 4 Diehl Rd., Lexington, MA 02173; e-mail: <fallick_gary@waters.com>

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Please send news for this column to: **Dave Packer**, secretary, 31 The Great Road, Bedford, MA 01730; tel: (617) 275-4056; e-mail: <70421.1766@compuserve.com>

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From Monterrey in Mexico, **Juan Llaguno-Farias** writes that he and his family are well and that, despite the country's economic problems, he continues to prosper as a "head-hunter" for Korn-Ferry International. Two of Juan's seven children, both sons, were married this past year with a third son engaged to be married in September 1996.

James Cobb who is living in Pittsburgh, Pa., also has a wedding bells' report. Jim's son, Kendall, was married in June 1995 and he and his bride are residing in Brookline, Mass., while Kendall studies economics at Boston University and his bride studies voice at the New England Conservatory. Jim, who is on the board of directors of the Pennsylvania Society of Professional Engineers, is working on treatment of hazardous waste using by-products from coal-fired power plants. He also is evaluating the technology transfer of natural gas vehicles.

At the time of our reunion, I reported that **Ted Kraver** was still working on a PhD at Arizona State University. I am happy to report that he is now Dr. Kraver, having finished a quest begun in 1964 "when a major hurdle was passing the scientific Russian exam." Ted wrote that "one huge 1,000 lb. gorilla has just left my shoulders," and he can get on with "conceptualizing grand visions where learning technology saves the world." While he works on the grand design, he intends to publish several papers on flat-belt transmission design methodology, slip, and vibration.

Peter Belmont has passed the New York Bar exam. Peter notes that, unfortunately, job prospects are not great for a 57-year-old "baby lawyer" with 28 years experience in programming computer compilers and with an interest in environmental, as well as trust and estate law. Peter asks that anyone with a good job prospect get in touch with him at 166 Columbia Heights, Brooklyn, NY 11201; or phone him at (718) 596-2648. Peter also writes that his son, Jeremy, is teaching English to Chinese speakers in Los Angeles, following the teaching career of his late mother. Finally, Peter adds that with law school and bar exam behind him, he is again finding time for cello and chamber music. He recently spent a weekend playing Brahms, Tchaikovsky, and Mozart—which included a Mozart quartet "with me faking second violin on the cello, when only one real violinist could be found. Vaguely reminiscent of Danny Kaye at Tech Night at the Pops, Tom Lehrer's concert, and



Starting with preliminary speculation about his nomination, through the appointment process, and into his first year on the job, it has been hard to find anything said or written that is less than effusive in its praise of the performance of John Deutch, '61 (center), as head of the CIA. This photo of Deutch and his wife, Pat, with President Clinton was first published as part of a cover article in Parade magazine in November 1995.

other MIT musical hijinks so many years ago."

Many of you probably saw the article about **Sheila Widnall** in the Sunday, February 11, *Parade* magazine. I especially empathized with her quote, "[O]ne of the big things at MIT is that they try to kill you on that first physics test. . . . They try to shock you into understanding what is expected—the degree of independent thinking that is required vs simply reciting known facts from memory." Right on, Sheila!

I'll close with something for which we all have bragging rights, our class project, the Endowment for Innovation in Education. The 1994-95 Alumni/ae Activities report (enclosed with your February *Technology Review*) shows that our Endowment is the largest project of any class since 1950. As your class agent, I add that it continues to grow as a tribute to your generosity and belief that students will continue, paraphrasing Sheila, to benefit from the best the Institute has to offer in fostering independent thinking rather than just reciting known facts.—**Frank A. Tapparo**, secretary and class agent, 15 S. Montague St., Arlington, VA 22204; e-mail: <ftapparo@lmi.org> or <ftapparo@aol.com>

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35th Reunion

I got a sad note from **Betsy Nehf** last January in which she wrote: "Sadly I am writing to you to inform you that **Charles H. Nehf, Jr.**, died on November 21, 1995, after a long bout with cancer. At the time of his death he was president of Eck-Elec Enterprises, Inc., an electrical contracting firm specializing in commercial and industrial applications. He was also an active farmer and breeder of Limousine cattle. He is survived by his wife, Mary Elizabeth (Betsy), and son Richard. Also by stepsons, Jonathan and Joel Botwin." Chuck graduated in Course VI, and was a Delta Tau Delta. I know I speak for the class in expressing our deep condolences to Betsy and Chuck's sons.

Glenn Stoops sent in a short note reporting that he is a data processor for R&L Carrier in

Wilmington, Ohio. He says that the company has 1,200 truck drivers all controlled by one little mainframe in the "back room." . . . Those of you who stay up late at night may have seen **Dave Latham** on *Nightline* back in October. Dave was part of a group that discovered two planets circling a distant star—a long sought but not surprising result. Ted Koppel asked him whether it was an exciting moment and Dave replied: "I didn't get excited until I found out that we were going to be on *Nightline*. Then I went back and checked my data to make sure the discovery was true."

Eric Essene sent in an update. As a professor of geology at University of Michigan he gets to travel quite a bit. Last summer he went to Northeast China (once called Manchuria) to check on some diamond mines. He was there to study the origin and age of the minerals from the earth's mantle that are encapsulated in diamonds. It took him 20 hours to go 1,000 km from Beijing by train. He writes, "I was most impressed with the high quality of the food available everywhere, even at 'truck stops' in the countryside. However very few people outside of Beijing speak English (except for the children). It's important to have multiple letters of introduction from high level Chinese bureaucrats in order to travel by yourself in China."

You may know that our class sponsors several nice scholarships for undergraduates. Every year new recipients are announced. They are selected by the Institute on the basis of the class's requests. During the 1995-96 academic year five students were aided. Three were holdovers from last year. The two new folks are **Hai Po Sun** and **Joseph Mendoza**. Hai Po is graduating in Course VI this year. Very active in Chinese affairs at MIT, he also gets involved in football, volleyball, and badminton. He wants to become a software engineer. Joseph is a junior in Course II and he is active in the MIT Society of Hispanic Engineers and in various community service projects around the "Toot. He wants to eventually work toward an MBA.

Richard Metzger writes that he is "working on a great consulting assignment applying work-flow automation to research activities in

global securities processing. We are in the process of building a house on Martha's Vineyard with a planned move there in early 1996." . . . Here is an e-mail I received from **Romney Bidulph** in early February: "I am still working for AT&T, in the controller's organization, and living in Mendham, N.J. I am on the local high school board, trying to improve the focus on academics. A son, who graduated from Stanford, is also working for AT&T in Coral Gables; a daughter, who graduated from Berkeley, developed her own food for runners and bicyclists, and founded the company 'Power Foods.'"

Peter Bankson writes that he and Marjary celebrated their 34th wedding anniversary by spending a month (last January) in Vietnam. It was a chance to visit a district where he had served as an advisor 29 years ago. His company "Cities in Schools" is growing. It's a nationwide network serving more than 200,000 troubled youth and their families. Peter says he can't escape his Course VI minor—he is VP in charge of government relations and information management. . . . **Leo Cannon** remains a partner at Coopers and Lybrand in Dallas. He notes that Coopers is MIT's auditor! Recently he was elected to the company's board of partners. Leo's wife, Diana, is in her second year as an entrepreneur. Her business is angels. Her company: Heavenly Angels. It's a gift shop specializing in the winged creatures. Daughter Cindy graduated from NYU a couple of years ago and works in mental health and living in NYC.

Alex Ross is troubled to find that 35 years have passed. He relates that life has been good to him: one marriage, two adult kids, challenges galore, and good health. He is with Chevron. . . . **Bernie Goldhirsh** was honored by the Magazine Publisher's of America late last year, along with Helen Gurley Brown, former editor of *Cosmopolitan*. The prize, the industries highest award, was the Henry Johnson Fisher award. All this came about from getting *Sail* magazine off the ground in 1967 with a \$65 investment. *Sail* was a success and Bernie sold it in 1980 to concentrate on *Inc.* magazine. In its first issue he had an article about Steve Jobs and Steve Wozniak, their garage, and Apple computers. It's been uphill since then and *Inc.* has a circulation of 650,000.

Bennet Zaren, who holds a position of some prominence in our class, is a grandfather: Monica Zohar born last December 29. All are well. We hope the child does not take after its grandfather. . . . Finally a news release says

Richard Oeler is VP of energy and materials at Air Products in Allentown, Pa. Richard has spent 26 years at Air Products. The new position means that he is in charge of a billion dollars worth of materials and energy. Shortly after his appointment there was a flood in Allentown. Any connection, Richard?

—**Andrew Braun**, secretary, 464 Heath St., Chestnut Hill, MA 02167; e-mail: <andrewb820@aol.com>



Richard Oeler

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Richard B. Stein writes that he recently stepped down as director of the Division of Neuroscience at the University of Alberta, where he has been on the staff for 27 years.

Richard established the division 18 years ago to foster neuroscience research across campus. He has a daughter who is a psychiatrist and a son who is a nurse—the generational career reversal—so much for stereotypes. He and a group of colleagues have established a new company, Neuromotion, to market worldwide the devices they've developed to help stroke and spinal-cord-injured patients improve their mobility. . . . **Greg Brown** sent an e-mail message and acknowledged that the Internet is definitely the way to send alumni news. He has been a sporadic correspondent over the past 34 years by his own admission—but then we might have nothing but drivel if everybody replied to every inquiry. He and Sherri had a shotgun wedding (his own words) and now have their first child, Siena Morgan, born December 6, 1994. Greg is presently professor of medicine (cardiology) at the University of Washington in Seattle. His group recently received a substantial NIH grant to study the treatment of patients with coronary disease and low levels of HDL-cholesterol. On December 5, 1995, Greg received the NIH National Cholesterol Education Program (NCEP) Clinical Science Achievement Award for his research over the past decade. He can be reached at <bgbrown@u.washington.edu>.

Court Skinner dropped in an e-mail from Silicon Valley; he's at <court@ampere.nsc.com>. He is the director of technology in the newly established research laboratory at National Semiconductor. He is concerned that engineering education lacks breadth and liberal arts education lacks depth, which leads to engineers who only solve problems and politicians who can only create them. This leaves growth in the hands of physicists and economists—a scary thought (and as an economist I would support that conclusion). He remains optimistic however, that our children will figure this out and fix it. Court has three kids—Nicole, '90, a polymer engineer; Heidi, a lawyer; and Loren, a philosopher (now I know why he's so optimistic!) His wife, Barrie, '66, is running the Semiconductor Products Division of Horiba Instruments, Inc. . . . **David R. Spencer**, his wife, and family are looking forward to attending the June '96 mini-reunion, not just because it is their 34th, but because their son expects to get an SB in economics from MIT in June. Son, Scott, made the choice with his father's blessing—David thinks it might be the smarter than Course VI, but only time will tell. He notes that quite a few of Scott's classmates have parents that went to MIT. David continues to run a consulting business focused on digital color. He can be reached at <drspncr@aol.com>.

Dave Bragdon got an e-mail off just before leaving for Paris, France, for a week. On their Christmas card, **Bev Walker** mentioned that Jack Walker had received the highest award for civilians that the U.S. Air Force bestows. His son, Jeremy, a first year medical student at U. of Michigan Medical School, confirmed this after visiting Chez Walker in Ann Arbor. Jack is still at ERIM <jwalker@sbridge.erim.org>. Dave also mentioned that **Keith Burgess** is designing a racing vessel and has invited him

ClassNotes

down East (Maine) to see the nautical design on his new Pentium "drafting board." Dave is uncertain if he'll accept the follow-up invitation to join the BETA testing off the coast of Kennebunkport. Dave and his wife, Regina, enjoyed the visit of **Jerry Winston** to Boston, arranged through the MIT1962 e-mail connection. They got to visit with Jerry at their home in Harvard, Mass., and enjoyed an excellent supper at a Thai restaurant on Charles Street at the foot of Beacon Hill. The way Jerry invited them to dinner was by saying, "Let me shout you out." In Australia, this means "it's my treat," (as in shouting "Waiter, bring another round of ale for my friends!") Jerry is a professor at the Royal Melbourne Institute of Technology and was on a professional visit to the U.S.

Please send your personal news to: <mit1962@mitvma.mit.edu> or to me directly: **Hank McCarl**, secretary/ P. O. Box 352 Birmingham, AL 35201-0352; e-mail: <hmcкарl@mail.business.uab.edu>

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Lots of alumnews to bring you up to speed on. I know it's been a long while and I apologize. Don't ask. . . .

Dave Johnson, Course VI, now married about 36 years, has four children through college and, at last count, four grandchildren. . . . **Jim Champy**, Course I, continues as chairman and president of the CSC consulting group as well as corporate VP of Computer Sciences Corp. . . . **Alan M. Schindler**, Course VIII, is a pediatrician/pediatric endocrinologist in Philadelphia. He also teaches at two medical schools. He has written a book, *Too Tall? Too Short? Too Fat? Too Thin?* (about children's growth). He has developed a computer program for monitoring lead poisoning in children. . . . **Daniel J. Gross**, Course XV, has completed his first year as president of Enhance Financial Services, a company he helped found in 1986. In 1992, he was ranked a National Master by the U.S. Chess Federation. I wonder what he thinks about the Kasparov-Deep Blue match.

John H. Wasserlein, Course II, left Boise Cascade in Idaho and moved to Connecticut to join the American company, Fraser Paper, Ltd., as president and director. He is also a director of the Canadian company, Fraser, Inc. By the time you read this, one daughter should just have finished high school and the other have graduated Tech in mechanical engineering, making his family a "Tech Tribe." . . . **Steven W. Miller's** (Course VI) family is another Tech Tribe. Their son, Scott, is a grad student at MIT in ocean engineering, working on the Robotuna project (a venture jointly funded by Starkist and Orion Pictures?). Steve's fourth book, *Cardiac Radiology: The Requisites*, was published in March. Last year he was awarded a Harvard-Macy Scholarship for Physician-Educators to develop multimedia for medical students at Harvard Med. . . . **Tony Geisler**, Course XV, a self-described "raisin broker" (really food ingredients), loves working out of his home and living near Wal-

nut Creek, in the San Francisco Bay area. His wife, Dee, is a resource specialist in the local schools and also is active in the community. They are really a Tech Tribe. Rebecca, their elder daughter, graduated MIT in '93 and is finishing her last year at UCLA Law School. Daughter Wendy is engaged to Rob Fong, '92, who works for Rockwell at NASA in Houston. Wendy graduated from the University of Texas and also works at NASA, Houston, at Krue Labs. . . . **Pat Morzilli**, Course V, almost made Tech Tribe. She writes that she is in shock that her daughter, who was accepted at MIT, decided to take one of her two full scholarships elsewhere. Kids!

Steve Fisher, Course XVIII, recently finished a three-year term as chair of the Department of Mathematics at Northwestern Univ. He had been associate dean of the College of Arts and Sciences. Let us know what you will do now, Steve. . . . **Alan T. Marty**, Course VII, has a private practice in cardiovascular surgery. In 1994, he was honored with the Alfred Soffer Award for Editorial Excellence by the American College of Chest Surgeons. He is on the editorial board of several medical journals and has published close to 400 articles and book reviews. . . . **Phil Marcus**, Course VI, our past secretary, still interviews undergraduate candidates for MIT. President of the Maryland chapter of the American Society for Training and Development, Phil has his own PC consulting business, specializing in database programs; Windows 95 is his forte.

Shingo Nishikawa is representing AT&T in its efforts to set up a fiber-optics cable in Pune, India. He met classmate **Kirit Sheth**, Course VI, in Bombay. Kirit, he says, is in great shape because he meditates, has managed a great high-tech company for 20 years, Hakotronics, and has a great family. Kirit's wife works for the company and their daughter is hoping to come to the U.S. for an MBA. Kirit says real estate is out of sight in Bombay, higher than Tokyo and Hong Kong, but Shingo thinks the Bombay bubble will burst as it did in the other two. Kirit says that **Minoo Shroff**, Course VI, has retired in St. Augustine, Fla. Shingo makes an interesting observation, namely that the India he had dreamed of as a student is to be found in the countryside, not in the cities. He says, "I am an easy captive to the irresistible charm and hypnotic power of the rural towns and the surrounding sceneries." . . . Another classmate associated with AT&T is **Mike Maul**, Course VI. He e-mailed to say that he has left AT&T Bell Labs after 27 years and will work for Texas Instruments in Houston, Tex. It will be a change from New Jersey, but Mike grew up in Kansas, so it's back to the central states. He will be head of North American design centers for digital signal processing, a position similar to his post at AT&T where he was head of all international design centers for the applications-specific integrated circuit area. He still enjoys taking his horse on long distance and endurance rides 50-100 miles per day (but does his horse enjoy it?). I can see it in Texas, but not in Bayonne.

Also with Bell Labs, **Marty Eisenberg**, Course VI-A, e-mailed to say that he and wife Esther had been to California and had seen **Bjorn Conrad**, Course XVI, and **Ted Cohn**, Course VI (both AEPi fraternity brother of ours), whom he had not seen in 30 years. Bjorn, described as still energetic and fun loving, married Kirby 10 years ago. He is the

proud father of five children, the youngest of whom is 3. He (Bjorn, not the 3-year-old) has a transportation consulting firm that he formed after leaving Stanford Research Institute. Ted is a professor of vision sciences at Berkeley. His wife, Barbara, is a medical researcher at Berkeley. They have three children whom Marty describes as "remarkable." Marty himself is a distinguished member of technical staff at Bell Laboratories where he has worked since 1967. He is a pioneer of a branch of queueing theory called "polling systems" (systems of queues with a single cyclic server) and is responsible for a significant breakthrough in that field, which he presented in a paper in Boca Raton. He and Esther have two daughters. One has an MBA from Columbia and works for Merrill Lynch in Manhattan, and the other, after living in Paris for a couple of years, returned to the U.S. to work for Fidelity Investments. Marty, who played squash as an undergraduate, still plays three to four times a week.

Another AEPi fraternity brother, **Richard W. Weiner**, Course XIV-B, was named executive VP at the Connector Set Toy Co. He headed the original legal team who set up the company that makes K'NEX toys. Rich graduated from UPenn Law School after Tech and was president of the Philadelphia Bar Foundation and treasurer and member of the board of governors of the Philadelphia Bar Association. As chief counsel of the Pennsylvania Securities Commission, he was principal draftsman of the Pennsylvania Securities Act. I don't remember him taking drafting. . . . **Elliott Bird**, Course XXI-B, yet another AEPi brother, writes that aside from his hernia operation (he doesn't recommend it), he and his wife, Toby, who is an English professor at Nassau Community College, are living the good life. They spend Christmas in Maui, July in France, and they weekend at their apartment in Manhattan, doing theater and opera. Their son, Eric, is a Kennedy Fellow at Harvard's Kennedy School. He may take a course at Tech.

Another Course XXI-B graduate, **Alan Meyer** writes that he is teaching at Arizona State University/West Campus. After being "sponsor in nomine" for his brother-in-law's wedding in the Philippines, he and his wife, Nancy Felipe Russo, traveled to Tegu, South Korea, where she gave a guest lecture at the Women's University on psychology and women's issues. . . . **Roy Komack**, Course VI-A, e-mails that he would like to hear from us and accordingly has sent his changed Internet address which is now <royk@komack.com>. He is a certified financial planner in practice as Komack Management Services, Inc., in Natick, Mass.

Regarding the Class of '63 Scholarships, Sumer Johal's scholarship was renewed, and he graduated in electrical engineering and computer sciences. He is currently in an MBA program. Jonor J. Jones also had her scholarship renewed and is expected to graduate this year in materials sciences and engineering. A new recipient is Hector Padilla from El Paso, Tex., who is a junior this year and majors in mechanical engineering, but ultimately will pursue medicine. He is an active member of the Society of Hispanic Professional Engineers and LUCHA (La Union Chicana por Aztlan).

Richard Merrill, Course II, e-mailed that he is working on font software at the AGFA division of Bayer Corp. in Wilmington, Mass. He has twin daughters, one working at DEC and

the other at MathSoft. His other children have been exploring the globe. His son hiked through Europe, and his daughter worked for a short time in the Dominican Republic. Speaking of the Dominican, I have had an apartment and part ownership in a hotel in Puerto Plata since 1981. If anyone is planning to travel there and would like some information, give me a shout, or its electronic equivalent. . . . Still on the international front, **Laurence Beckreck**, Course XVIII, writes that he has been teaching math in a Derby, England, high school for the past eight years. He and his partner of the past seven years, Fiona Aitkin, moved in together about a year ago. She is an Anglo-Scottish therapist. Her children, Ben, 18, and Freya, 15, live with them. Larry's older son, Seth, is now 28 and works for British Rail as an electrical engineer. Joshua is now 26 and is completing a four-year teacher training course and would like to go to Harvard. Larry encourages e-mail at <lbeckreck@arcade.demon.co.uk> and visitors (prior notice please) to their home in Nottingham (yes, you know the one). They entertained Dee and **Tony Geisler** (above) and **Frank Model's**, (Course V) wife, Sue, who was on a research project in England.

James H. Lattimer Course VII, XVIII, says his daughter, Veronique, has rowed with the Vassar Varsity Women's Four for the past two years and reminds him of his days on the MIT crew (yes, but who's team was better looking?). Jim says she will graduate in '97. . . . **Woods Bowman**, Courses XIV-B and VIII, wrote that he and Michele Thompson have celebrated their 10th anniversary. Woody left county government in Evanston, Ill., where he had been CFO, and after a short stint as interim president of Goodwill Industries, he joined the faculty of DePaul Univ. in the public service management graduate program. . . . **John E. Graham**, Course VIII and II, wrote that his son, Michael, finished his second year of medical school at Temple Univ. in Philadelphia and his son, Peter, finished his freshman year at the UC/San Diego. . . . **Maury Lanman**, Course VI, writes that after 15 years of management for several small, mostly now defunct, technology companies, he has gone back to doing something he really likes. As a technical staff member at Alcatel Network Systems in Richardson, Tex., for the past year, he is back to technical work and finds that he still has the "MIT edge" (and how many times have we all felt that and been damn glad to have it!). . . . **Jim Hallock's** wife, Georgie, wrote to say that he was selected by NASA to be on a special seven-member commission to investigate any space shuttle mishaps. They view launches differently now. He works for the Department of Transportation. Their sons have a wide variety of interests. Ted is graduating high school this year and AJ will graduate Brandeis next year with a bachelor's and a master's degree in chemistry. . . . **Jack Solomon**, Course V, is now a director of technology planning for PRAXAIR, an industrial gas company. He presented a paper on technology planning last January. He is involved in the MIT Club of Westchester, N. Y., and MIT's Educational Council. His wife, Jan, is resuming her quest for a PhD. . . . **Roger A. Hinrichs**, Course VIII, recently became chair of the Physics Department at SUNY/Oswego. His textbook, *Energy and our Environment*, was just released in its second edition. Roger

was a Fulbright Scholar in the Sultanate of Oman in 1993. . . . **John R. Brach**, Course I, is busy directing engineering designs for the transit authority in Atlanta in preparation for the Summer Olympics. A new heavy-rail system will be activated, a CNG bus facility completed, and an Intelligent Transportation System inaugurated. Says John, "Come to Atlanta and experience the fun this summer!"

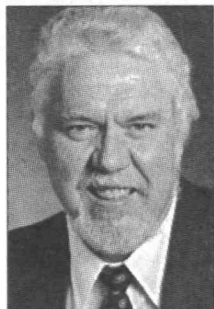
Besides keeping you up to date on all these satisfying pathmarks in our lives, it is also my sad task to report the passing of those of us whose paths have already ended. These are people with whom our experience revives vivid memories and emotions, at the same time coming at a point in our own lives when we have to face our vulnerability and mortality. . . . **Reinhold Frederick Hollendar, Jr.**, Course XIV-B, died June 30, 1992. He had been living in Minneapolis. No further information is available. . . . **Harold Reed Gregg**, Course X, died in California on April 13, 1993. He had been VP for auditing for Transamerica Corp. . . . **Charles Albert Bridges**, Course III and VIII, died January 21, 1995, in Urbana, Ill. He had a wide range of interests. After graduating Tech, he took a master's degree in physics at U/Illinois with an emphasis in both elementary particle physics and astronomy. As a systems analyst and senior scientific programmer, he assisted in the operation of the solar telescope at Peak Solar Observatory in Sunspot, N.M., and since 1980 was assistant specialist at the Computer-based Educational Research Laboratory at U/Illinois. Interested in the natural sciences and a leader in computer cataloging, he produced in 25 years of independent work seven catalogs of butterflies, moths, and dragonflies. He was a member of Sigma Phi Epsilon. His obituary ends with the delightful note, "He danced at the Regent Ballroom in Savoy."

Keep the alumnews coming! Try to get it to me by the first of the month. You can reach me by snail mail: **Shoel M. Cohen**, secretary, Dept. of Psychology, Nassau Community College, Garden City, NY 11530; e-mail: <71271.2627@compuserve.com>. You can also call me at home at (516) 286-6453. It would be great to talk to you personally.

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Stanley D. McKenzie (XXI-B) has been named provost and academic VP at Rochester Institute of Technology (RIT). Stanley, who has a PhD in English literature from the

University of Rochester has been a professor at RIT for 28 years. He has also



Stanley McKenzie

served RIT as interim provost and academic VP for the past year and a half and was integral to the development of the university's strategic plan. In making the appointment, which followed a nationwide search, RIT President Albert Simone said, "I am pleased that we had an internal candidate who was such an outstanding match for this university's leadership requirements. Stan's educational experience, leadership skills, and boundless energy will be important factors in RIT maintaining its position as the leader in career education." In his personal time, Stanley reads Shakespeare and journals on 16th-century literature and enjoys camping, backpacking, and hiking in the Northwest, typically Alaska and the Cascade Mountains.

Russell Morris has accepted an appointment at Wesley College in Dover, Del., as dean of students, leaving behind a six-year career as a professor of theology at a Lutheran seminary in South Carolina. His daughter, Claire, received a PhD from MIT two years ago and now works for Molten Metal in Waltham. . . . **Robert Gray** is currently professor and vice chair of electrical engineering at Stanford. His most recent book is entitled, *Fourier Transforms: An Introduction for Engineers*. Bob's current research is on image compression and classification and on image quality evaluations, especially for medical images. In what passes as the best hard luck story I've heard this year, Bob was "marooned" for six days

ClassNotes

during the great blizzard of '96 at the Ritz Carlton in McLean, Va., while participating in a digital mammography panel for the U.S. Army.

Jeffrey Michael (XXI-A) is still working as an independent environmental consultant in Eastern Germany and recently made a TV film debut in a half-hour report on the promise of renewable energy sources. He reports that the chance of developing highly efficient infrastructures in this part of the country was missed. Eastern Germany already has the same number of automobiles, but double the shopping centers per capita than in the West! . . . **Martin Stieglitz (XVI)** and Ann continue to explore and enjoy the mid-Atlantic states while he is assigned as Boeing program manager for the Army's Comanche helicopter program. Both children are now college grads and employees, so they expect to be feeling wealthy any day now!

Please send mail to: **Bill Ribich**, secretary, 18 Revere St., Lexington, MA 02173; tel: (617) 862-3617; e-mail: <mit1964@mitvma.mit.edu>

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Bill Samuels finally reported in. Bill continues to pursue ACTV, and interactive, individualized concept for television which would, among other things, allow you to follow

a sporting event through any camera in the stadium. Bill claims ACTV as the source for the Triplecast. ACTV now has 300,000 subscribers (Montreal and London) and is just beginning its first installations in the U.S. Bill was married for the first time on December 17, 1995 (we must be approaching the last first marriage for the class). He continues to spend much of his time raising money for his favorite Democrats.

Barry Pollack reports he is now VP for R&D for IC Verify, a startup in Oakland with a significant position in the area of instant credit verification. . . . **Chris Ebbe** continues to be on the National Examinations Committee of the American Board of Clinical Psychology where he recently participated in a redesign of the examination process for clinical psychologists. . . . **Walter Miller** was recently elected a Fellow of the American Association for the Advancement of Science. His molecular endocrinology lab at UC/San Francisco continues to do work to determine the molecular basis of various diseases. Most of his time is spent raising kids (Samantha, 10, and Nathaniel, 6). He says, "I have now switched full-time from Beacon Venture to Gel Sciences as we go into full production of several product lines."

I recently spoke with **Nick Stepaniuk** to network into Mallinckrodt. Nick continues to enjoy St. Louis. . . . We're enjoying our grandparenthood with regular trips to Rapid City to visit our grandson. Is anyone approaching great-grandparenthood?? Please send news to: **George McKinney**, secretary, 33 Old Orchard Rd., Chestnut Hill, MA 02167; tel: (617) 232-4710; e-mail: <georgemck@aol.com>



Leon Katz, '64, 20,200 feet high on Mt. Illimani ~ Cordillera Real Mountains, Bolivia

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66 30th Reunion

For the third month in a row,
I have received lots of news,
which makes it much easier to
write this column.

Former Class Secretary **Jeff Kenton** is still consulting on software in the Boston area, working on "networks and other stuff nobody but other programmers ever use directly." He has been doing interesting work for a French company and gets to travel to France once a month. . . . **George Randall** writes (for the first time in 30 years) that his career has focused on liquefied natural gas importation for 20 years. For the past four years, he has been a principal in a small consulting firm, LGA Engineering. Combining skills with his partner, a mechanical engineer, the firm specializes in the processing, transportation, and storage of a variety of petroleum products. He and his wife, Cindy, live in Newburyport, Mass., and have two daughters. They will be celebrating another 30-year milestone this summer, their wedding anniversary.

Dennis Nagy also sends along a catch-up letter. After an SB degree, he earned a master's in civil engineering from MIT, and then a PhD in structural engineering from UC/Berkeley. He started out as a member of the research staff at the University of Stuttgart's Institute for Statics and Dynamics of Aerospace Structures, and then taught at Princeton before holding positions in computer-aided engineering management for General Electric Medical Systems and Structural Dynamics Research Corp. For the last ten years, Dennis has been with the MacNeal-Schwendler Corp., the world's largest vendor of finite-element-based engineering modeling and analysis software. He has been senior VP since March 1993 and has worldwide responsibility for sales and support of all MSC software products and related services. He lives in Los Angeles with his wife of 26 years, Dori, whom he met in Stuttgart. They have two children; son, Chris, is a senior at UC/Berkeley, and daughter, Marielle, is a high school sophomore.

Alan Newhall has taken a different direction. He is pastor of the Bartonville United Methodist Church in a suburb of Peoria, Ill. Alan plays a lot of parts in his life—from the lead in Gilbert and Sullivan's *The Gondoliers*, to coaching a recorder concert for the high school's madrigal dinner each fall, to taking youth groups on 10-day canoe camps in the Quetico Wilderness of Canada, to leading work groups to areas of need. His last trip was to the West Bank of Palestine and he is now arranging another to Palestine for next January. He was so enthusiastic about his activities in his letter that he really made his work sound like play. Alan and his wife, Kathy, have three children.

Ronald Zelazo is CEO of Kearfott Guidance and Navigation Corp. in Wayne, N.J. Kearfott makes precision navigation equipment for ships, submarines, land vehicles, aircraft, satellites, and interplanetary probes (including *Galileo*). Ron's eldest son, Dan, will graduate from MIT this June. . . . After two runs for U.S. Senate, **David Vanderskoff** has settled down to work again in order to pay his campaign debts and support his medical school daughter and college son.

The recipient of our class of 1966 Doc Edgerton scholarship for 1996 is Mayra DiCristina. Mayra is a junior from Guaynoba, Puerto Rico, and is majoring in chemical engineering. She is active in the Association of Puerto Rican Students and the Society of Hispanic Professionals Engineers. She enjoys playing the piano and stays active through volleyball, aerobics, and body building.

On a somber note, we have lost one of our most active classmates. **William Kosinar** died early this year of colon cancer at the age of 51. At the time of his death he was managing director of Furman Selz, Inc., a New York investment banking firm. He was also treasurer of our class and a member of the reunion committee. A sports enthusiast, Bill had played football in high school, hockey and lacrosse at MIT, and rugby at Harvard. He loved golf and skiing and played hockey until his final illness. He leaves his wife, Patricia, of Cambridge.

A surprising number of classmates have children receiving MIT degrees this June. We know they will be around for at least some reunion activities. Come and join them.—**Eleanore Klepser**, secretary, 84 Northledge Dr., Snyder, NY 14226-4056; e-mail: <vismit66@ubvms.cc.buffalo.edu>

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The "turning 50" disease continues to spread throughout our class. **Pete Denton** and **Don Bellenger** celebrated their birthdays by jumping out of an airplane and then

freefalling from 13,500 feet to 5,500 feet before their chutes opened. They did enjoy it and both recommend it for other thrill seekers. Hmm. Pete's daughter Tracey is at the UPenn, and his son Keith is a freshman at Bates in Maine. Audrey is busy with her interior design business, and Pete manages Denton Vacuum, which offers high vacuum deposition equipment and thin film coatings. . . . **Andy Lemur** has co-written a book on innovation in the design and construction industry, which was published a few months ago. He plans to teach and direct research at Purdue as a visiting professor of civil engineering. Also, his consulting work continues, and, although the Lemur family has settled into their new Baltimore home, Andy spends much time inside the Washington Beltway. . . . **Ted Nygreen** took the opportunity on his last birthday to review the prior year and write me a letter. He joined Radio Computing Services, Scarsdale, N.Y., and is number one in the world for music scheduling software for radio stations. Ted is enjoying running an operation from the inside instead of consulting from the outside, and he's happy to be back in the middle of both the broadcasting and software industries.

A quick correction regarding **Marc Levenson**. Marc's in Boulder on a one-year visiting fellowship at JILA, a joint institute involving Colorado Univ. and NIST, and he's looking for a professorship. JILA is a premier institution in several fields, including lasers and spectroscopy, but is suffering from the proposed downsizing of NIST. Marc also does editing work for *Micro lithography World* magazine. . . . **Larry Galpin** writes that it's finally happened—their two daughters are in college (Georgetown Univ. and UColorado). They are

building a home in old Tappan, N.J., and trying to sell their home in Wilmington, Del. They moved north because Larry is now VP for sales & marketing at Daikim America, which makes fluoro polymers.—Please send mail to: **Sharlotte and Jim Swanson**, co-secretaries, 878 Hoffman Terr., Los Altos, CA 94024; e-mail: <jswanson@lat.com>

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Please send news for this column to: **Gail and Mike Marcus**, co-secretaries, 8026 Cypress Grove Ln., Cabin John, MD 20818; e-mail: <ghm@nrc.gov> and <mmarcus@fcc.gov>

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Please send news for this column to: **Eugene F. Mallove**, secretary, 171 Woodhill-Hooksett Rd., Bow, NH 03304; e-mail: <76570.2270@compuserve.com>

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This month we will finish with our e-mail backlog as well as transmit messages received with late 1995 donations. . . **Stephen Smith** e-mailed us: "After helping

the Young Presidents' Organization in Dallas jump on the Lotus Notes bandwagon in 1995, Nancy and I have returned to The Netherlands, where I have joined the management team of the USoft Products development center in Naarden. My current focus is double-byte enabling and localization of our software for Asian markets, starting with Japan, Korea, Hong Kong, Singapore, Taiwan and China."

. . . **Steve Grant** lives in Jersey City, N.J. and trades options for his own account on the American Stock Exchange. He spends most of his vacation time at the three national duplicate bridge tournaments each year, and "once in a while, I even do well." . . . **David Asbell** e-mailed us: "My mother died last January, and I'm still busy with her estate. The Georgia Tech Research Institute is reeling, as usual, from the end of the Cold War, Tri-services squabbles, and general pecuniary strangulation, so I play as much as I can. I've run several 10K races this year, with a best time of 45:51. Spent four days in West (by God) Virginia kayaking the Gauley with a bunch of old timers. Michele and I dove the reef off the Florida Keys for a week in August. We are enjoying our "new" house, which we just spent two years renovating."

Howie Bluestein is one of our more "exposed" classmates. He has appeared in the IMAX film "Stormchasers" and in the National Geographic television special "Cyclones" in November 1995 on NBC. This spring he is on sabbatical at the National Center for Atmospheric Research in Boulder. . . **Larry Ng** wrote: "This is my tenth year working at Lawrence Livermore National Lab. Some of the successful projects I've personally been involved in were the 3D mapping of the moon surface in 1994 with the Clementine mission and imaging and tracking a bullet to locate its source in real time." . . . **Mark Ketchen** is the director of physical sciences at

the IBM T.J. Watson Research Center. Mark received the 1995-96 American Institute of Physics Prize for Industrial Applications of Physics for the design and development of integrated superconducting quantum interference devices (SQUIDs). SQUIDs are the basis for emerging commercial applications of magnetic sensing, such as biomagnetism, non-destructive testing, and materials characterization. . . . **Michael W. Hurst** told us that in August 1993 he cofounded InStream Corporation with his partner, Lawrence Baker. InStream products facilitate easy composition and transmittal of administrative, financial, and clinical data for the behavioral health care (mental health and substance abuse) industry. "In our first two years we raised \$2.3 million from private sources including IBM/Lotus; won an ATP/NIST grant for \$1.37 million; and in August 1995, closed a venture deal for up to \$6.4 million," he reports. The company's network and software interface products are being used by four managed-care organizations that provide care for 6 million people. "This venture uniquely combines my background from MIT (XXI-B-2), as a former practicing clinical psychologist, and as a managed-care executive," Michael says.

Tom Bales also brought us up to date: "Turns out that **Bill Box** (Burton 2nd, Course II) and I kept running into each other over the years. The last encounter involved us in starting a surgical instrument business (Symbiosis Corp.) and selling it for (as Bill would say) rude bucks—resulting in Bill and I living across the canal from each other on a nice side of town. I am now starting up a rocket-engine development company (Environmental Aerospace Corp.) with Kevin Smith (Random II, '83), who was another founder of Symbiosis." . . . **Mort Jonas** recently stepped down as director of finance and administration of the Florida Grand Opera (after helping them recover from a \$650,000 deficit). He moved from Miami to Asheville, N.C., where he has established himself as a nationwide consultant for nonprofit organizations. Locally, Mort is helping with fund-raising, press relations, budgeting, accounting, computer issues, volunteer scheduling, and whatever else is needed to make a success of the first-ever alumni/ae reunion of the Black Mountain College Museum and Arts Center. Mort describes Black Mountain College "as a hotbed of avant-garde folks in the arts from 1933-1956."

Skip Jackson continues as pastor of the First Presbyterian Church of Lebanon, Ore. His daughter, Kimberly, is 7, and his son, Nathan, is 4. Skip comments, "It looks like I could have two kids in college with I'm 63. How's that for family planning?"

Finally some short notes: **Jeff Shultz** co-edited *Journeys Through Ethnography: Realistic Accounts of Fieldwork*, published by Westview Press this year. . . . **Michael Hoffman** is chair of the Department of Mathematics and Computer Science at California State University, Los Angeles. . . . **Ed Sayer** has become medical director for western Massachusetts for Tufts Associated Health Plans.

We've run out of our e-mail and regular mail. Please send us some more.—**Karen and Greg Aronson**, secretaries, 125 W. 76th St., Apt. 2A, New York, NY 10023; e-mail: <dghm13d@prodigy.com>

ClassNotes

71 25th Reunion

Jerry S. Greer was recently appointed team leader of the Pricing Group at Boston Edison. . . . **Robert M. Pepper** has been living in Ormond Beach, Fla., since 1982. His wife, B.G., and he have three children, James (15), Katie (13), and Dan (8). Although he doesn't miss the cold, he goes skiing every winter. He has started a number of businesses, all of them with toys or playground equipment. He travels extensively, visiting with customers and suppliers, including trips to Asia and Europe, and he opened a plant in England earlier this year. Robert will be there for our 25th. He hopes to see you there, also. Calling all performers and others in the fine arts profession, please contact Nelson Sharfman, '92, at (617) 821-0366 (h) or (617) 386-0048 (w). He is on the arts committee of the MIT Club of Boston.—**R. Hal Moorman**, secretary, P.O. Box 1808, Brenham, TX 77834-1808

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David Drummond is in Belgium completing a third year as general manager of Nordion Europe, manufacturers of radiopharmaceuticals for nuclear medicine. He is "getting hooked on the European lifestyle." . . . **Sarah Simon** reports: "My new job title, 'Mom,' brings with it lots of work and lots of fun. I am working on air quality projects at EMCVON part-time and have also hung out a shingle as Apple Creek Associates, Environmental Consulting. Abbie's already demanding to use our computer so she may be helping out before I'm ready." . . . **Maury Goodman** continues his work promoting a long-baseline neutrino oscillation experiment using a neutrino beam from the Fermi National Accelerator and a detector at the Soudan mine in Minnesota. This project, called MINOS, has received numerous approvals but needs congressional funding. Also, he is looking forward to attending the 1996 Democratic Convention, having been chosen an alternate delegate on the Clinton slate for the 14th Congressional District of Illinois.

Last summer **Bob Fourer** completed the sixth (and final) year of his five-year term as chair of Industrial Engineering and Management Sciences at Northwestern. This year (through August) he is on sabbatical at the Computing Science Research Center of Bell Laboratories in Murray Hill, N. J. He says: "My arrival was perfectly timed to provide a close-up view of the latest AT&T breakup, which is fortunately proving to be not too great a distraction." . . . **Duncan Allen** is still with De Leuw, Cather in Boston, dividing his work over the past few years between transit/highway and some exciting assignments for the FRA, including detailed models of safety and total operating costs for both maglev and high-speed rail. He says: "Nearing empty nest with respect to our son; Jo-Anne and I are devoting more time both to outreach min-

istries through our church and to recreation—significant application of low-speed surface transportation (canoe & XC ski) in the second category.”—Co-secretaries: **Dick Fletcher**, 135 West St., Braintree, MA 02184; e-mail: <albion.r.fletcher@cmail.ac.ge.com>; and **Wendy Elaine Erb**, 6001 Pelican Bay Blvd., #1001, Naples, FL 33963

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Sylvia Weatherford is currently working for Xerox in the Integrated Document and Industry Solutions Department as a project manager for systems integration projects.

She is also an MIT educational counselor, serving schools in the Compton and Haethorne, Calif., communities. . . . **Tom Lydon** is currently managing several distributed-software engineering facilities for Raytheon in eastern Massachusetts, including those in Tewksbury, Sudbury, and Marlborough. **Steve Richardson** is in Silicon Valley as VP of product marketing for Compression Labs, a video-teleconferencing manufacturer. Wife Susan is at Apple, daughter Julie is a sophomore at Berkeley, and son Scott is a high school senior planning college. . . . **Tom Ellis** is presently working on the SBIRS program as seen in the Nov/Dec 1995 *Technology Review*. Son Matt is eating them out of house and home, while Kevin is taking computer classes at day care. Send news to **Robert M. O. Sutton, Sr.**, secretary; “Chapel Hill,” 7721 Churchill Ct., Marshall, VA 22115; e-mail: <sutton@smppcmail.prc.com>

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Robert Minshall has been working as senior videotape editor at Encore Video in Hollywood, Calif., for the last five years. He has created visual effects for TV shows such as the *X-Files*, *Alien*, and *Hudson Street* as well as Oliver Stone’s feature film *Natural Born Killers*. When not busy creating special effects, Robert is coaching his son in baseball and spending his weekends surfing with his son at their Ventura County beach condo.

Our former class secretary **Lionel Goulet** and his wife, Susan Joan Lee, announce the birth of their son, Alex, last November. Lionel introduced his company, Target Marketing (founded by Jim Trebbe, ’75), to the Internet, so now you can reach Lionel at <goulet@tmar.com>.

Please send news to: **Barry N. Nelson**, co-secretary, 65 Hillside Ave., W. Newton, MA 02165-2543; tel: (617)-969-0600, Ext. 239; e-mail: <barry@world.std.com>

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Apologies for missing our last column. But that means this one will be bigger! **Paul E. Clift** writes, “For the past five years, I have been working harder than I ever knew possi-

ble building a software and consulting business devoted to litigation support. With over 50 employees and offices in five cities, we are now happily past the survival stage and looking forward to continued success and growth. My wife, Amy, and I are also running hard to keep up with the activities of our 10-year-old

daughter and 14-year-old son. Our son unfortunately believes that he wants to attend a liberal arts college like Yale. Yuk! How will I survive? I’d love to hear from any of you especially any PKS alums at <75371.300@compuserve.com>.”

Walter P. Lapatovich traveled around the world in 1995 delivering invited lectures on advanced light sources in Kyoto, Japan, and Bad Honnef, Germany. He says that raising three children and balancing a technical career has been his greatest challenge. . . . **Phillip R. Webber** was recently appointed VP for human resources in IBM’s Software Group. . . . In October 1995, **Harlan Davis** was making a career decision as follows: “For the past year, I have been head over heels into my career. After a carefully thought out move from Reno Airlines to Midway Airlines, I have become a simulator instructor as well as a regular captain on the Fokker 100 Aircraft. My job as instructor moved it’s headquarters from Chicago to Durham, N.C., in the late spring, which has again made me a migrant worker. But in late September, I was offered a job with United Airlines, to be based in Chicago. As of this writing, the decision is heavily in favor of United, but the final decision has not yet been made. I have not had much of a personal life for the last three years, and the move to United would provide that option, so we shall see.” (My advice: opt for the personal life.) . . . **Ken Deemer** is a principal in a new start-up company, My Favorite Charities, Inc., which has introduced a service to help charities raise money more efficiently from individuals. Donors pledge to make gifts automatically and regularly to charities of their choice using their credit cards. (As long as it cuts down on annoying phone calls, I’m all for it.)

On October 1, 1995, **Dave Presotto** wrote, “Help! I’m trapped in the huge industrial complex called AT&T Bell Labs. The loud speakers are announcing, ‘Be calm! Remain in your offices. The breakup is for your own good!’ My Internet line is fluctuating. This may be my last chance to tell the world #@!” . . . **Ronald L. Buckman** is practicing family practice and sports medicine in Bolton, Conn. . . . **Kenneth S. Rumstay**, one of our stargazing classmates, had the following to report: “SARA (Southeastern Association for Research in Astronomy) offered its first NSF-sponsored REU program this summer (check the SARA homepage for details). The SARA 0.9m telescope at Kitt Peak is now fully functional. I am currently engaged in mapping galactic HII regions in Ha and H β , and in monitoring variations in continuum emission from Seyfert galaxies.”

After 15 rewarding years with the Research Division at IBM, **Paul H. Siegel** accepted a position as professor of electrical and computer engineering at the UC/San Diego, effective July 1, 1995. He is thoroughly enjoying the academic environment and the San Diego area. His wife, Darcy, and son, Oren (7), and daughter, Micah (4) are also pleased with the move from San Jose. . . . **Thomas Glenn Leo** announced, “My wife, Suzie, and I are, after all these years, expecting our first child, as well as our second and third! One boy, one girl, and one too modest to show the ultrasound equipment more than a profile. They are expected in February, and we know it will be the adventure of a lifetime!” . . . In September 1995, Fortune Minerals Ltd. announced

that **George M. Doumet**, president of E.J.D. Canada Industries, Ltd., joined its board of directors. . . . Finally, this Class Note from **James Demers**: “Well, so much for my career as a ‘company man!’ I’ve recently quit my job at J&J, having gotten frustrated by the triumph of politics over science. Not unique to any big organization, of course, but it got to be more than I liked to deal with. Chasing opportunities in small firms and academia; I’ll let you know where I end up. Alexandria is now 2 years old (closer to 3 when you read this) and a constant source of joy and amazement. I try to match her enthusiasm for life, but can’t compete with her capacity for learning. My e-mail address is <jimdemers@eworld.com>, for anyone wanting to drop me a line.”

Send news.—**Jennifer Gordon**, secretary, Pennie & Edmonds, 1155 Ave. of the Americas, New York, NY 10036; e-mail: <gordonj@pennie.com>

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20th Reunion

We are fast approaching our 20th reunion. Hopefully, we will have a large turnout. It

will doubtlessly be a memorable occasion. Be there!

From the mails, **Greg Hunter** writes: “I’m now teaching in Los Olivos, Calif. I have remarried and now have a family with four kids (two from hers and two from my first marriage). I used to think that going through MIT was a challenge, but my divorce of four-and-a-half years ago was clearly more challenging. I would love to hear from anyone from the past.” . . . From **Lee Silberman**: “Our daughter is 16 months old and is a terror; she gets into everything. Our son is now a blue belt in karate. I have been traveling and just returned from a two-week trip to China. I was part of the first Dept. of Commerce Textile Trade mission to the PRC. It was the most fascinating two weeks I have ever had, though very little business prospects. I have just gone online for the first time, and I am shocked that no one else has the screen name ‘Brassrat’ on either AOL or MSN.”

Jonathan Lettvin has joined the ranks of entrepreneurs. “My wife, Sharon, and I started a diskette business in April 1995. We developed VAR computer diskettes that both speed up File I/O and help fight the most epidemic viruses. We both have been working at Lotus for almost eight years, and our spare time is spent restoring our 1890 house and helping my mother develop an ambitious, groundbreaking Web page.” . . . **John Carney** has been named executive VP for product development at J3 Learning of Minneapolis, Minn. Prior to joining J3, John was the director of document imaging and COLD products for Wang Labs. While he was at Wang, he directed the product team that developed OPEN/image, a multiplatform document imaging and storage system that was named “Imaging Product of the Year” by *Imaging* magazine (which your secretary reads). J3 Learning is a leading developer and publisher of software education products and services.

From e-mail, we learn that **Thomas Bracewell** has accepted a position at Digital in Littleton, Mass., effective January 1996. He

reports, "I plan to be doin' the Vatican, barbershop style, this November. My group has an invitation to be the first group ever to sing barbershop music in the Vatican, for the Pope—just for entertainment, of course. I'll let you know how it goes." . . . From **Tom Downey**: "I'm still at Cisco Systems (who acquired LightStream Corp. last year from Bolt Beranek and Newman, and I moved over with LightStream). After some time in engineering management, I'm back in a business development role working on alliances and partnerships. Cisco is definitely an exciting place to work!" . . . From **Nick Koreisha**: "I ran into our classmate **Robert Winkler** last week, one of your listed 'missing' '76ers. I'm leaving Signal Corporation." Unfortunately, Nick did not pass along more info. Hopefully, we will learn more for the next issue of the Notes.

After almost 20 years, your secretary received a delightful call from **Jill Kurfist**. After finishing at MIT, she went on to get a master's in architecture from the U. of Washington. She then worked for two New York architecture firms, "SOM" and "HOK," both well known. While in New York, she met and married Howard Meeks, also an architect. In 1982, they moved to Seattle, where they still live. In 1987, Jill left architecture and moved into large-scale construction-project management around Puget Sound. She has her own consulting business and the headaches that come with it, compounded by the high-stress nature of big-budget construction. She has two children, Andrew, 10, and Nathan, 6, and she is very active with the Seattle Milk Fund, a 90-year-old charity that helps families at the cusp of welfare to 'make it' instead of sliding deeper, and the Women's Shelter, for women in need of refuge. She wants to encourage any classmates who come to Seattle to look her up.

For those of you who have not joined our "listserv" so as to receive the Notes by e-mail, as well as a directory of e-mail addresses of classmates, please e-mail your secretary at the address below. Approximately one quarter of our class is now part of the listserv. I believe that the other three quarters have e-mail addresses—but you need to send a message.

As for your secretary, I am experimenting with several new business ideas in the hope that they will be more profitable and less stressful than the vicissitudes of trading and easier sales than the computer integration and value added reseller (VAR) business.—**Arthur J. Carp**, secretary, Quantalytics, Inc., 220 Henley Rd., Woodmere, NY 11598-2523; tel: (516) 295-3632; fax: (516) 295-3230; e-mail: <quantalyt@aol.com>.

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Please send news for this column to: **Ninamarie Maragioglio**, secretary
9727 Stipp St.
Burke, VA 22105

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We bring you up to date with a lot of classmate news! . . . **Julie Keller Pease** writes us from Saco, Maine: "I feel pretty settled here after eight years! I am still in the field of

psychiatry and am finding it fun and challenging. Also fun and challenging are my two children. Evan (6) and Alison (2). I was 38 weeks

pregnant with Alison at the time of our last reunion, but plan to make it to the 20th with children and husband David Pease!" Julie and family spent a night at the Marriott in Kendall Square last spring, and noted how much the area has changed in 20 years. (Your class secretary finds himself noting how much we all have changed in 20 years!) . . . **Gary Cote** has relocated to Decatur, Ill., where he is assistant professor in the Biology Department at Millikin University. There he is teaching various core courses. He is also in charge of the fungi section of a team-taught class in biodiversity. Gary has been involved in the field of signal transduction in plants as well. In Decatur, Gary resides in a newly-acquired 1912-vintage home. He has been traveling, most notably to Pohang South Korea to collaborate with colleagues.

Shannon Maher sent back news with his Alumni/ae Fund donation: "I'm VP for research and development at Optimas Corp., a small (30 people) software company in the shadow of Microsoft. The technology is great, but the stress level is high. My wife had our second daughter last year—Jamie, about 15 months old now. Erin is 4—both very sweet and making life very full." Shannon and family reside in Redmond, Wash. . . . **Geoff Baskir** says, "I'm still involved in planning and design issues related to the Washington, D.C., airports. Emma is 3 years old and in preschool. My experience riding my bike to National Airport from home was ended one summer morning when someone stole my bike from my garage! I'm looking for another!" Geoff and family live in Alexandria, Va.

Richard Field relays another cryptic message: "Well, Jack Benny, I've reached Ox27. Enjoying life with Dickie, Eliana, Abby, Joe, and my wife of 10 years, Donna. Hi Jeanne. Where's Nino? Where's Garvin? I see Limp sometimes. Try <dick@novasoft.com>: Roland does." . . . **Jeff Snow** sends us news from Ft. Lauderdale, Fla.: "With life having been divided into training periods lasting 4 or 5 years (college, med school, and residency), things have become more stabilized lately: I'm married with two kids, have been in practice in Florida for six years now. I would like to hear from any MacGregor 'C' comrades."

Nayyar Butt: "Just returned from a five-day 400+ mile bike trip across Nevada. The scenery is breathtaking, as are the climbs over long mountain passes. I am still working for IBM in White Plains, N.Y." . . . **Stephen Anderka** writes briefly, "I am married to Mary Clare, and am an emergency department physician in San Francisco." . . . **Steve Norris** writes even more briefly, "I am a neurologist in Bradenton, Fla., married with two children." . . . **Steve Ratliff** recently left EDS after 16 years to join NPRI, a software firm specializing in call-center solutions. He lives in Herndon, Va., with his wife, Tonya, and their five children, Scott, Shelley, Patrick, Adam, and Carson.

Robert Asher shares good news: "It's a boy! Our first child, Nathan, was born in June. I don't understand it: He does not look like a nerd at all. He is absolutely gorgeous! In fact, his picture is featured in a Beth Israel Hospital publication." The button-popping daddy and family live in Needham, Mass. . . . **William Rifkin** says, "I am enjoying teaching with my mouth closed. I am responsible for business communication and business ethics in the

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Department of Management at the University of Wollongong, which is an hour south of Sydney, Australia." . . . Ed Nadler wrote while en route from Israel to the U.S. for a conference. "We moved to Israel in July 1994. Life here is exciting, never a dull moment. We have a new baby girl, Adina, born August 31. Our 7-year-old, Rachel, enjoys first grade, and is picking up Hebrew rapidly. My wife, Eileen, tutors English when she can find the time. I work at Cimatron CAD/CAM Systems as the company's mathematician. We would love to hear from old friends!" Ed's e-mail address is <ed@cimatron.co.il>.

Also in Israel is **Laura Schultz**: "My husband, Amichai, my children, 2-year-old twin girls, Liran and Yardenne, 4-month-old boy Sar-el, my two older stepsons, Elad and Nadav, and I moved to Meitar (outside of Beersheva) at the end of August." . . . **Mike Nathan** brings us up to date: "I'm still in practice at Mass. General Hospital, and still gradually pursuing a master's in medical anthropology. Lilly Louise Nathan was born March 21, 1995, and is a real joy. We moved to a new house in summer of 1995. . . . **Milton Royce** gives us the latest status after his last job move: "One year after my job change, both General Motors (former employer) and Chivas Products, Ltd. (current employer) are doing well. As the Big Three build on their commitment to doubling their purchases from minority-owned automotive suppliers, we are establishing a niche as a full-service (design, development, program management, manufacturing) supplier. We have the same challenges as all other 'new' companies: access to capital to fund rapid growth, which is exacerbated by the historic (and persistent) lack of such access for minority-owned firms. The response, however, from our customers and the financial community has been positive to our package of capability and 'excellence'. My experiences as DKE and IFC rush chairman are of great benefit for my position. VP for sales and marketing." Milton and family still live in Bloomfield Hills, Mich.

David Levens hails from Coral Springs, Fla. He writes: "I have recently merged my private practice in plastic surgery with two other colleagues in the same community. We opened a third office in Boca Raton in January." . . . **Jeff Stein** married Marla Lauren Schiff in New York City this past December. Jeff is a vascular surgeon and assistant professor of surgery at Mt. Sinai School of Medicine. Thanks to Sharon Lowenheim, '79, for the newspaper clipping. . . . **Dave Browne** tells us of "a bizarre couple of years—three different jobs and independent consulting (with a lot of time in between to think—and worry!). I've (finally?) landed as a health care management consultant at Deloitte & Touche in Boston. I'm still collecting boring postcards, but donations from the class have slowed considerably. Send me boring post cards c/o **Jim Bidigare** at the address below." (Thanks, Dave!)

Meanwhile, your class secretary has been entertaining the Alumni/ae Association encouraged idea of relying on e-mail to gather, assemble, and distribute Class Notes (in addition to publication in this journal). I've been hesitant to start surfing the Net, as it appears to be a black hole for time reminiscent of that witnessed with bridge players at the Institute. Your comments—for now, by more conven-

tional fax or mail—are welcome.—**Jim Bidigare**, secretary, 9095 North St. Rd. NW, Newark, OH 43055-9538; tel: (614) 745-2676; fax: (614) 745-5648

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Bob Stall has been named medical director for the nation's first hospice-operated skilled nursing facility, Kresge Residence, in upper New York State. Bob, who specializes in geriatric medicine, is also a clinical assistant professor at the University of Buffalo



Bob Stall

School of Medicine, a clinical associate at the University of Rochester Medical Center, medical director of two other nursing homes and residences, and medical advisor for a home-care concern, as well as having a part-time geriatric practice. . . . **Mark Stern** and his wife, Sharon, have moved to Armonk, N.Y.,

and are "enjoying the extra space, not to mention all the work getting the house in order. [Last year] was another great year, and we welcomed Brenda Gail in April as a younger sister to Stephanie, now 2. I continue to work in corporate finance at IBM, which has been quite an interesting place the last few years!" . . . **Jonathan Keefe** is attending Boston University's Executive MBA Program, and should be graduating in June. He is also teaching at BU's Metropolitan College. The MBA program took him to South Africa in the spring.

Beverly Wright is married with two children and working at a solar energy firm in Newark, Del. . . . **Walter Grossman** is the chief engineer of spacecraft attitude determination and control systems for the NASA Small Satellite Technology Initiative *Clark* Satellite, which will be launched this summer. Walter's most recent satellite, *Meteor*, was destroyed by the range safety officer when a launch vehicle failure occurred 43 seconds into flight. Walter lives in Annandale, Va., with his wife, Vered, and their three children. . . . **Ron Dictor** has survived Amoco's downsizings and is still living in Naperville, Ill. He writes, "My kids are now 15, 11, and 9. It's difficult to accept the fact that I'm the parent of a high schooler! Any of my roommates out there?" . . . **Drahomir (Mike) Lazar** retired from the Navy in November 1994 and started working with Teledyne Ryan Aeronautical in San Diego the following August. He is a senior manufacturing engineer on the Tier II+ high-altitude endurance unmanned-aerial vehicle advanced concept technology demonstration program. His wife, Martha, works as a senior engineer at Qualcomm, an electronics/telecommunications company. They love San Diego and may be putting down roots for a while.

Your faithful secretary is making her directorial debut with a one-act comedy that will open later this month. Directing is fun so far. I hope I'll still think so when it's all over. 'Til next time.—**Sharon Lowenheim**, secretary, 98-30 67 Ave., Apt. 6E, Forest Hills, NY 11374; e-mail: <lowens1@pfizer.com>

It's been a few months since I submitted news so there's a bit of catching up to do. . . . "Congratulations to Ron Raines," began January's column. I hope Ron saw it,

because I received another note from him wondering if news sent to the Alumni/ae Association was a "dead end." No, but sometimes it's a bit slow. News to the Association is passed to the *Review*, sorted, and sent to class secretaries once every six weeks. It is now early February, and I am writing the Notes for May. Since I missed submitting the news the last few months (a rare occurrence), there is probably a six-month delay in getting news published. This time can be cut down by sending news directly to me by e-mail or regular mail.

So on to this month's news. Congratulations to **Mark Karlen**. Mark writes, "For those of you who doubted this was possible, I am finally engaged to be married to Jennifer Johnson on May 25, 1996." . . . **Barry Cinnamon** e-mailed the announcement of the birth of Lily Gabrielle on December 23, 1995. She joins Julia (2) and Hank (6), making for cramped quarters at home in Upper Montclair, N.J. Barry is CEO of Allegro New Media, a growing software company specializing in CD-ROM and Internet products. Titles include *Betty Crocker's Cooking with Kids* and the *Berlitz Executive Travel Guide* series. You can e-mail Barry at <nygy14a@prodigy.com>. . . . **Leon Tabak** has been awarded tenure and promoted to the rank of associate professor of computer science at Cornell College in Mount Vernon, Iowa. He is also chair of the Cedar Rapids section of IEEE. . . . **Ed Chang** was recently promoted to senior financial analyst at Interet Corp. in New Jersey. Interet is one of two "major" software companies to address the complex domestic and cross-border leveraged leasing business. Last year Ed self-published *BUY-RENT.WK1* based on analysis he did for a personal finance book, *Get a Financial Life* by Beth Koblner, that should be out by the time you read this. Ed is the VP for publicity at CAMIT (Chinese Alumni/ae of MIT).

Life is busy as always for **Mary Rorabaugh**. She works as a controller at a small telecommunications company, plays on a year-round softball team and has two daughters: Amy, adopted four years ago, and Shelby, adopted this year. After ten years, **Adra (Smith) Baca** has left Sandia National Laboratories and is now working as a development engineer at AMP, Inc., in Harrisburg, Pa. Her two children, Nicholas (4) and Emma (2), are enjoying the change in scenery.

Completing a residency in occupational medicine so he can be double boarded in occupational medicine and psychiatry is keeping **Paul Homsy** busy. His new puppy, Bo, joins his two cats. He also expects to finish a long sought master's in public health this year. . . . **Steven Neustein** is assistant professor of anesthesiology at Mount Sinai Medical Center in New York City, specializing in cardiothoracic anesthesia. He, his wife, and their children, —Tommy (5) and Melissa (2)—live in Bergen County, N.J. . . . **Jim Scutti** and his wife, Bernadette, are enjoying their two children, Christopher (3) and Michaela (1). Bernadette is still keeping her nursing career going while Jim provides material engineering consultation

at Massachusetts Material Research.

News from one of the more regular correspondents, **Pamela (Hampton) Idriss**, is that their at-home business is keeping her and her husband, Samir, fully occupied day and night. She is especially proud of Samir's design for the commemorative piece for the 25th anniversary of the National Black MBA Association. . . .

Check out **Arthur Hu's** web page at <<http://www.halcyon.com/arthurhu/index.htm>> for *Asian Week* columns, diversity index, and a picture of his family. He appeared on local (Kirkland, Wash., TV stations) and on NPR discussing affirmative action. . . . **Matthew Steele** is still working for Texaco and feeling older as his sons enter elementary school.

This month's Class Notes close on a sad note. I have received notice that **Michael Blazquez** passed away last March. Our condolences to his family. Send your news to: **Kim Zaugg**, secretary; 549 Fairfield Rd., Canton, MI 48188; tel: (313) 981-1785; e-mail: <vayda@erim.org>

81 15th Reunion

The Wild, Wild East: After leaving Stanford B-School (in June 1991), **Watts Humphrey** enrolled in a language school in Taipei to continue his Mandarin Chinese studies. He soon found a job in project management for the local Bechtel subsidiary, which enabled him to at least pretend professional development while he was continuing in the student lifestyle. Three years and several thousand Chinese characters later, Watts moved on to a position with Asia Brown Boveri Ltd., a Zurich-based industrial multinational, as a project manager for the development and financing of large, private power infrastructure projects in China and East Asia. Since August '94, he's been living in Shenzhen, in Guangdong Province in the PRC. As Watts puts it, "Shenzhen is one of the more lawless locales in the 'Wild, Wild East,'" and it's a tough call whether the military police or the local Triads should be given wider berth. But politics aside, everyone seems to be "united in the rabid pursuit of profit." Sounds like a great place to do business! Watts hasn't been in touch with any alumni/ae on the mainland or in Hong Kong or Taiwan, but does keep in touch with contemporaries from Sigma Phi Epsilon. If anyone plans to be in the area, let me know and I'll pass on Watt's address.

Southern Exposure: We learn that **Giles Novak** is currently an assistant professor at Northwestern University in the Department of Physics and Astronomy. Giles works in the area of astrophysical observations from Antarctica.

Parenthood: Lots of baby news this month. **Michael Baylocq** and wife **Mary Wright**, '82, have adopted their second child, Christian, last November, and big sister **Camille** (4) is doing her best to help out with the new baby. Michel tells us that he "remains a space cadet—designing and launching satellites for Space Systems/LORAL" while Mary works part-time for Scopus, a software firm. In their spare time, "we try to remember what it was like to have spare time." . . . **Jeffrey Oehler** and wife **Mary (Britt)**, '82, are now the proud parents of **Grant Mitchell**, born last September.

Up the Infinite Corridor MIT and the Technical Imagination

by Fred Hapgood

This lively, eminently readable account of MIT's engineering research will stir up memories while bringing readers inside some of the current projects happening around the Infinite Corridor. Delving into MIT's rich, sometimes bizarre history, *Up the Infinite Corridor* explores the folkways of undergraduate life, as well as the unique sense of humor that emerges

from the pressures and insecurities of the place where everyone's intellectual accelerator is wired to the floor.



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Grant is their first child, and as Jeffrey puts it, "If I had known how much fun he would be, I'd have suggested we have him years ago." Oh yes, Jeff and Mary both like their jobs, too. . . . **Robert Steinberg** and wife Alice Sung had their first baby, Jason Scott, last December. . . . The big news for **Lorenzo Sadun** and wife Anita was the birth of son Allan Elvio in April '94. He's keeping mom, dad, and sister Rina very busy. Meanwhile, Lorenzo and family are enjoying life in Austin, Tex., where he's an assistant professor in math at U/Texas.

A final note: after almost three years at the same address (a local maximum), I've relocated once again. A little more room, a lot closer to the office, and two spaces in the garage. . . . Hope to be seeing many of you at the reunion.—**Mike Gerardi**, secretary, 412 N. Oakhurst Dr., #202, Beverly Hills, CA 90210; tel: (310) 203-8080 (w); e-mail: <mimg@jmbm.com>

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Congratulations to **Linda Schaffir Sigman** and husband Michael who had a daughter, Laurel Gayle Sigman, born last November 14 and weighing 6 lbs., 13 oz. . . . **Robert**

Schoenberger is still a partner in a small industrial video/machine vision/telerobotics firm. They are buying their first building and will move in by January. His e-mail address is: <rob@subtechnique.com>; and his web address is: <http://www.subtechnique.com>. . . . **Kirk Holmes** is director of Cable Industry Services for Systems Research and Applications Corp, a \$130 million technical services and systems integration firm.

Astronomer **Heidi Hammel**, principal research scientist at MIT, was honored by Girls, Inc., of central New York for her efforts to open new career avenues for girls. . . . **William Schwartz** is celebrating ten years as a general contractor and owner of a construction management firm, Intech Construction. He was recently recognized as 1995's General Contractor of the Year, Philadelphia's 40 under 40, Philadelphia's 100 fastest growing privately held companies and made the Inc. 500 list. Will resides in Merion, Pa., with his wife, Valerie, daughter Ali (4), and son Drew (3).—**Helen (Fray) Fanucci**, secretary, 502 Valley Forge Way, Campbell, CA 95008; e-mail: <fangroup@aol.com>

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Robert Kidd writes that he and his wife, Bonnie, are excited to report the expected arrival of their first child on or about December 30, 1995. Ultrasound imaging indicates

it's a boy, and Robert and Bonnie will name him Samuel Robert. . . . **Arlene Taylor** writes that, after a year in the Orlando area, she is moving back to Cincinnati. She is interested in finding other Cincinnati area alumni/ae who can look Arlene up in Loveland, Ohio. . . . Another **Taylor, Alan**, and his wife, Leslie, hosted a recent MIT alumni/ae of Colorado event, which was an artist studio crawl. The event featured five Boulder area artists' studios. Alan's parents, John and Nancy, were featured in a recent *Technology Review* Donor's Profile.

The Class of 1983 Student Aid Fund has

renewed funding for **Yulan Liao**, '96. Yulan is a chemical engineering major from San Francisco and is doing research in Professor Sinskey's laboratory, investigating the ability of a mutant strain of bacteria to concentrate and accumulate metallic ions. For project lab, Yulan designed a self contained exhaust ventilation system for operating tables in anatomy classes that directs formaldehyde vapors away from the breathing zone of students. She hopes to earn an MD and pursue a career in biomedical engineering. Yulan is also involved with the Womens Chorale and the Concert Choir. She volunteers at Massachusetts General Hospital and was also the winner of the MIT Boy Short Story Prize. Thanks to all of our classmates who made contributions that are sponsoring Yulan.

Please keep those cards, letters, faxes, and e-mail coming!—**Jonathan M. Goldstein**, secretary, c/o TA Associates, High Street Tower, 125 High St., Suite 2500, Boston, MA 02110; Fax: (617) 574-6728; e-mail: <jgoldstein@ta.com>

84

Got a lot of updates this month. Here's one from **Karl Reid**: "Last October my wife, Andrea, gave birth to our second child, Karl Andrew, one month after his older sister,

Jasmine Whitney, celebrated her fourth birthday. I'm now in my fifth year at Programart Corp. in Harvard Square. We develop and sell application performance software for large systems. Last October I took on a new position as manager of Engineering Services, responsible for developing professional services to complement our product line. A significant challenge, not unlike my MIT experience. Personally, I am a lay minister at my church in Mattapan, which is also attended by **Richard Williamson** and **Lance Parker**."

Robin Johnson is now director of research and design at SciTrek, the science and technology museum of Atlanta. He says, "This position allows me to focus on the conceptualization and creation of new exhibits and programs. I just directed the design and production of SciTreks first traveling exhibit, *Cyber Playground: The thinking machine learns to play*. This was a fun look at the first 25 years of electronic games. We had a total of 30 vintage game stations, including *Space Invaders*, *Defender*, *Battlezone*, *Asteroids*, *Magnavox Odyssey*, *Alteir*, etc.!" . . . **Laura Bagnall** writes in to mention that she has moved to Flashpoint, a small software company. Her son Alex is now in first grade. She is getting married this month to Steve Sharp; the wedding ceremony will be at her parents house in Orvieto, Italy. Congratulations, Laura! . . . "I have been working as an environmental consultant for 10 years now," writes **Daniel Felten**. "I am presently working at Groundwater and Environmental Services, Inc., as regional engineering manager. My wife, Sarah, my two children (Maya and Matthew), and I are living in Northampton, Mass." . . . **Dale Rothman** moved to Vancouver, B.C., in July 1995 to begin a postdoc with the Sustainable Development Research Institute at the Univ. of BC. Prior to this position, Dale spent two years with the World Resources Institute in Washington, DC. . . . "I'm still living in Boston!" writes **Stephen**

McDonald. I'm still working for EAPS at MIT. In July 1995, I traveled to Hawaii to present a paper at the annual DPS meeting of the American Astronomical Society."

This press release just in: **Dr. Wendy Lin** has joined the GE R&D Center as a chemical engineer. Wendy received a PhD in materials science and engineering from Stanford Univ. in 1993. Wendy and her husband, Scott Finn, have a son Jonathan [great name!—Sec.] and live in Schenectady, N.Y.

Yours Truly has just made a career change. I left Logitech and am now full time at my own business, Diamond Systems Corp., a very small (but growing!) maker of data acquisition and custom OEM electronic circuit boards for embedded control systems. The company survived its first seven years with me only part-time; now lets see if it can stand me being there full time! Check out my new e-mail address. Please send new to: **Jonathan Miller**, secretary, 1708 Plaza Ct., Mountain View, CA 94040; tel: (415) 813-1100 (w), (415) 961-2394 (h); e-mail: <jdm@diamondsys.com>

85

Greetings all. First, sports and weather: Pittsburgh has had its share of national attention with its two disasters. The floods on the Mononghela and the Allegheny, and,

worse, the Steelers' loss to Dallas in the Super Bowl. And now the rest of the news.

Bill Bruno writes, "I've become immersed in trying to understand how biomolecules work by analyzing the evolution of their sequences. The mathematics is working; the question now is how much nature reveals about herself in her molecular history. I've really been excited about this work. I'm still at Los Alamos National Lab ('til the money runs out), and about to try my hand again at the NIH grants process. Still single, no longer running much, but doing lots of dancing." . . . **Larry Butkus** writes, "Following two-and-a-half years as an instructor at the Air Force Academy, I've been sent back to school for a PhD in mechanical engineering at Georgia Tech." . . . **Ed Korczynski** is still living in Santa Cruz. After 10 years in the semiconductor business, he is now the West Coast editor for *Solid State Technology*, the leading trade journal for semiconductor fabrication. . . . **George Fan** and wife **Dr. Yvette Fan** (Wellesley '87) just had their first baby, a girl named Lauren. Mom, Dad, and baby are doing well in Fremont, Calif.

John Ragan reports: "I've been at Pfizer Central Research for nearly three-and-a-half years, where I'm currently working as a medicinal chemist in the osteoporosis group. My current project involves new drugs that cause the body to increase the amounts of growth hormone in the blood stream; such a drug would be useful for osteoporosis, as well as a variety of other age-related disorders (e.g. post-surgical wound healing, frailty, increasing lean:fat tissue ratios, etc.). Outside of work I'm keeping busy with my recently purchased house (killing mice, shoveling snow, feeling guilty about how run down the garden looks), and playing jazz Pfizer, and am looking forward to hosting **Greg Fu**, an assistant professor of chemistry at MIT later this year. . . . From **Lyle Tripp**: "Actually life is going really well for us. My wife, the former Linda

Zimmerman '88, and I had a boy, Andy, in May. Last February, my old firm went under when Linda was six months pregnant. Best thing that every happened to me. I got a new job the day before she delivered and we haven't looked back. I converted that contract job into a full-time position as a project manager for a restaurant software firm the first of the year."

Mike Cassidy chimes in: "Still working at Stylus Innovation, the software company I helped start a few years ago. We're up to about 20 people now. Our main product, Visual Voice, is a Visual Basic add-on component that lets people build a variety of computer telephony applications such as interactive voice response (e.g., touchtone banking or 333-FILM), fax-on-demand, voicemail, etc. Check us out at <www.stylus.com>. My wife, Caroline Wang '86, and I went to Germany this summer. One of the highlights was the Checkpoint Charlie museum in Berlin. Lots of amazing pictures, stories, and remnants of stuff used to escape from behind the Iron Curtain. Kind of sad and kind of uplifting at the same time."

Send news to Bill Messner, secretary; 5407 Pocusset St., Pittsburgh, PA 15232; tel: (412) 421-4334; e-mail: <bmessner@cmu.edu> or <mit1985@mitvma.mit.edu>

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10th Reunion

Mary Cox Engebret writes from Ashburn, Va., that she got out of the Air Force on

June 30. She is now a professional staff member for the House of Representatives Permanent Select Committee on Intelligence. She says, "Even with the time demands, I still put my other full-time job first: being a mom. The kids are growing like weeds. In the fall she was back in Boston for a wedding, and hoped to see Anne Fricker Hutchinson, who with her husband Jim, '95, recently had a baby boy, Halsey. . . . Brian Ralson, MD is practicing family medicine and sports medicine in Chicago. He is also on the faculty at a family practice residency program.

Steven Kroft, MD will be finishing a pathology residency at Northwestern Univ. Medical Center in June of this year, at which time he will begin a fellowship in hematopathology at the UMchigan. . . . Bill Thackston and his wife, Susan Bower (Wellesley '86) have just moved back to this native Atlanta, where Susan is a Fellow in geriatric psychiatry at Emory School of Medicine. Meanwhile, for the past two years, he has been working in field service engineering for a controls company—a position which most recently took him to China for several weeks. Most recently, he has taken a more attractive offer from Orion CEM, an Atlanta-based consulting engineering firm. . . . Adrienne "Momi" Ono is leaving grad school ("finally") to pursue a career in law enforcement. She reports that her husband, Scott Texter (PhD '85 in nuclear engineering), is still at TRW working on the AXAF program.

Elizabeth Fortunato sends greetings from Southern California. She finished a PhD in December 1994, took a few months off to relax, and then started a postdoc at UC/San Diego in May 1995. She says, "These last few

months have been kind of hectic trying to apply for funding on my own. Keep your fingers crossed." . . . Douglas Roth got married on February 17, 1995, to Doreen Wray, MD, an anesthesiologist in New York City. There were finally headed on their honeymoon to Europe in October. Currently he is finishing his chief year in general surgery at Bellevue Hospital and will start a fellowship in plastic surgery in July.

Alexandra Klikoff is now in her third year of ob/gyn residency at Univ. of New Mexico and is beginning to see the light at the end of the tunnel, though she's not looking forward to job hunting next year. Her husband, Les Watts is working for Orbital Studios, a small, computer game company based in Emoryville. Their kids, Michael (9) and Katie (4) are doing well, with Michael already in the fourth grade. He says, "See you all at the reunion!" . . . Roy Briere writes from Ithaca, N.Y., that he finally received a PhD in physics from the UChicago last spring. Although he now works as a postdoc for Harvard, he is currently stationed at Cornell, where the particle accelerator used in his research is located.

Joe Megna continues to live in Honolulu, Hawaii, and besides start-up consulting, he remains active in numerous community service organizations. Most recently, he has assisted some undergraduates at UHawaii to obtain a charter from Sigma Phi Epsilon. He is serving as the Hawaii alumni board president, along with his other MIT Sig Ep brothers, Dan Curran, '85, Bob Robinson, '85, Roger Horton, '89, and Eben Steifel, '79. His invitation: "If you have the time to visit, please give me a ring and meet with other MIT alums in the Aloha State and come sailing. I still live on a 35-foot sailing sloop and would be happy to show you Hawaii via the waterways."

John F. Martin and his family (wife, Shirley, and three children) just returned from six months overseas in Amsterdam and London, where John ran several projects for McKinsey and Co. He says, "We all had a phenomenal time, especially living in Holland and sailing in the Greek Islands." He recently went to the weddings of Pete Ulrich, and Dave Pehlke. In each case, The Snipes, their college band, along with Karl Butner, '87, played a reunion set. He saw many other Sigma Chis there, including Jeremy Verba, John Sapirstein, and Rob Sabo. . . . Carolyn Anne Reeves Saarinen started a business about two years ago doing custom flags for individuals, businesses, and schools. She says, "I'll applique and sew anything except adult clothing. It's not yet a booming business, but combined with taking care of my 6-month-old son, it's a full-time job." They moved to Ohio in the fall of 1994 and love it so far.

Lastly, two commercial announcements. First: our 10th Reunion takes place from June 6-9. It begins with Tech Night at the Pops on June 6, continues with tours of MIT labs, Boston, and Cambridge on June 7; Tech Day on June 8 focusing on emerging technologies in biotech, communications, and materials; and concludes on June 9 with Tech Challenge Games and Techsas Barbecue. We hope that all classmates will try to attend at least some of the events. For more information, please contact Caroline Thomas at (617) 253-8225. Final administrative note: If anyone reading this column would like to be added to our class e-mail list, or would like to change your

ClassNotes

existing e-mail address on record at MIT, please send e-mail directly to: <mitalum@mitvma.mit.edu>. To submit news items to Class Notes, please write to: Bill Hobbib, secretary, 5 Cappy Cir., West Newton, MA 02165; e-mail: <mit1986@mitvma.mit.edu> or <billhobbib@aol.com>

87

I'd like to thank all of you who are sending me updates on a regular basis. Your help makes this column really easy and fun to write. And to those of you who just read and

don't write—what are you waiting for? Send in your news and see it here!

There are a number of relocations to report this month. Dennis Benjamin wrote to inform us of his rather extreme change of address: Southern California to Britain! He and his wife, JoAnn Ten Brinke, just finished PhDs (Dennis at UC/SF in medicinal chemistry; JoAnn in environmental health sciences at UC/Berkeley) and have accepted three-year post-doc appointments at Oxford University. Dennis is working at the Oxford Centre for Molecular Sciences, and JoAnn is with the Department of Social Sciences. Although they both think that living at Oxford is great fun, they miss the Bay Area climate.

Tom Hoffman has accepted a nice promotion, and as of October 1, 1995, is the director of manufacturing for Colgate-Palmolive New Zealand. The manufacturing facility that he is managing is in Wellington (the capital), and makes products not only for New Zealand but also for export to Australia, Fiji, New Guinea, and parts of Asia. Of the 200 employees in the plant, 125 factory workers and 25 manufacturing professionals (engineering, purchasing, quality control, etc.) report directly to Tom. He and his wife are planning to stay for three to four years, and are looking forward to traveling the South Pacific and enjoying the fine weather there. . . . Patrick Kim has packed up his family, and is in the process of making a move from Switzerland to Japan. Before reaching Japan sometime in early 1996, they planned to spend time traveling and visiting with family in France and Florida.

Closer to home, James Cross and his wife often pondered and romanticized about the idea of moving from Columbus, Ohio, to a larger metropolitan area. They've finally done it. They're temporarily living right off Harvard Square in good old Cambridge, rapidly amassing parking tickets and spending way too much time in bookstores. By this spring, they expect to be living in the new house they have just purchased a few miles up Mass. Ave. in Arlington. James is working in the Advanced Thermal Technology Unit at Arthur D. Little, Inc., which provides technical consulting services to the energy, transportation, and chemical industries. He finds his new job to be both intellectually stimulating and fun.

Ben Linder left Oracle after 8.5 years, and has joined a tiny startup called Libris. He took some time off before joining his new

company, and split his days between reading books at the local coffee house and playing with his 18-month-old son Canaan. **Bryan Moser** recently visited the Linders from Japan, where he is now officially a PhD candidate at the University of Tokyo. Ben described what Bryan does as "cross-cultural team-oriented distributed engineering processes." The Linders also regularly see **Chris Linn** and **Trish Kellison**, '84, who both work at Apple. Their daughter Emily, now about 2, and Canaan are regular playmates.

As of February 1, **Steve Berczuk** left the MIT Center for Space Research, and has joined Optimax Systems Corp. (also in Cambridge) as a systems engineer. Optimax is a small (about 15 people), three-year-old company that builds "semi-custom scheduling applications." While he enjoyed his stint at MIT, Steve is looking forward to working in industry again. In addition to his main work at MIT, Steve worked in the area of software design patterns, and has a chapter in the book, *Pattern Languages of Program Design I* (Coplien and Schmidt, ed., Addison Wesley, 1995). He will also have a chapter in volume

two which comes out mid-year. This summer Steve and his wife, Lena, are planning a trip to Alaska to visit a friend who is working as a doctor there (apparently, this is not just a great idea for a TV show).

Jonathan Suber and **Kelly (Wethers) Suber** got married on May 14, 1994, in Rockville, Md. Since then, Jonathan has joined Kenan Systems, a software firm in Cambridge. Young Victoria Suber was born on February 17, 1995. . . . Also in the marriage department, **Robert Krawitz** and **Manny Gani** (Simmons, '81) are engaged, as of last December. Rob promises to send more details.

Greer Swiston reports that the Boston branch of CAMIT (Chinese Alumni of MIT) has gotten off to a great start. Their most recent adventure was a ski trip in mid-December, perfectly timed to coincide with the first snowstorm of the year. Greer, husband **Rob Swiston**, and their son **Parker** (who was very good about pointing out the snow), **Gene Ng**, **Yuchun Lee**, '88, **Brian Pan**, '89, **Kristing Ma**, '93, and **Janet Lee** were hosted in a condo at the foot of the slopes owned by **Kenneth Kan**,

'79. All had fun skiing (and subsequently rediscovering forgotten muscle groups), and after a soak in the jacuzzi, stayed up all night playing sadistic card games they recalled from college, allegedly involving hand slamming, elbow jabbing, fruit, and animals. Greer is looking forward to incorporating some Community Service activities to the CAMIT agenda, hoping to lend support similar to that which she received while growing up. Over Christmas, the Swistons saw **Gina** and **Stan Oda**, as well as **Jay Cohan**. Jay is still busy with business school, and has not even found the time to watch *Seinfeld* (which everyone tells him he must watch at least once, 'cuz he looks like Jerry Seinfeld!). Greer also heard from **Sofia Merida**, who is happy to have moved out of her earthquake-damaged apartment to another one in L.A. Her new apartment is right where the floats line up for the Tournament of Roses Parade, so she got to see the parade without having to sleep out on the bleachers the night before.

Keep writing!—**Jack Leifer**, secretary, 2908 Roses Run, Aiken, SC 29803; tel: (803) 642-3900; email: <leifer@sc.edu>; listserve: <mit1987@mitvma.mit.edu>

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Erik Troelsen wrote in after eight years of silence. You probably remember him as Troel, from Troel's Partyline, a flyer listing the parties for each weekend. Erik gave up his budding career as a social coordinator and went to work for Raychem Corp. in Menlo Park, Calif. He worked there for seven years starting as a design engineer and finishing as a production manager. In 1992, Erik married **Terri Ross** of Cupertino, Calif., and they have recently (September 1995) relocated to Vancouver, Wash. Erik now works for Hewlett-Packard's Vancouver Deskjet Printer Division as a new product ramp engineer. The other big news arrived on December 6, 1995, a baby girl, **Kayli Alexandra**, "who is just incredible!" Erik keeps in touch with several MIT friends and **Phi Delta Theta** brothers and will be in **Per Cederstav's** wedding in May.

Karen Wu also reports a very eventful past 12 months, beginning with the birth of daughter **Natalie** on Christmas day 1994. Karen then finished her residency in Pediatrics at Columbia University in June 1995 and moved to the suburbs with her husband, **Denley Chew** (Harvard, '87), to begin private practice. . . . **Ed Forzani** graduated from Wharton Business school last May. Ed is currently working for AT&T in the Future Systems and Technology Co., focusing on wireless infrastructure. . . . **Mark Shudt** is attending Harvard Business School and is looking for something interesting to do when he finishes in May. . . . **Stacey Arbeiter Salomon** married **Marshal Salomon** (Brown, '87) on March 19, 1994. She is living in Southern California, working as chief of staff to the dean at the Anderson Graduate School of Management at UCLA, after having received an MBA from the same school.

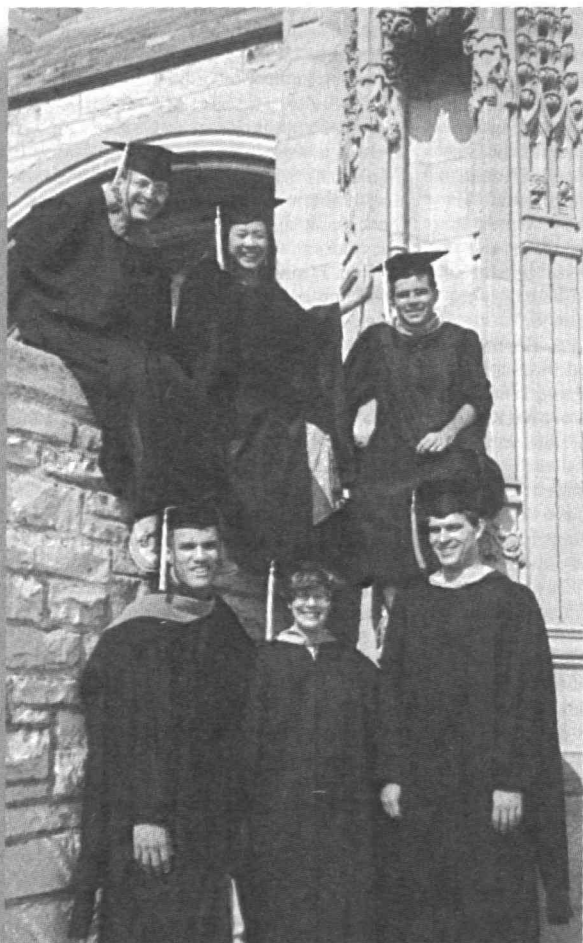
Randi Rubin Protter and husband **Glenn** are living in central New Jersey with their 20-month-old son **Ryan**. Randi writes that Ryan keeps them on the go and gives them clarity amidst the chaos. Randi will be finishing her internal medicine residency next year and is looking forward to private practice. Please send news to: **Catherine Suriano Singer**, secretary; 131 Main St., Andover, MA 01810-3804; e-mail: <singer@mit.edu>

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This month's list of people to please send news is: **Jee Chung**, **James Goldstein**, **Joel Gwynn**, **Yichen Mao**, **Lisa Porter**, and **Steven Towle**.

What are y'all up to? If anyone knows about any of these people or anyone else, please write in. I think everyone must have made a New Year's resolution to send news, as I have gotten a ton of it this year (thanks to everyone who wrote), so here goes!

Our Class of 1989 Scholarship fund is doing well, and the 1995-96 awardee is **Naresh Desireddi**, a senior chemical engineering major from Austin, Tex. Naresh, who plans a career in medicine, participated in a UROP project last summer measuring thermal conductivity and diffusivity values in breast tissue for use in hyperthermia treatment of breast cancer. Outside of the lab, Naresh volunteers for the Links program at a local elementary school. . . . **Eric Lund** defended his PhD thesis in physics at Dartmouth last November, and is starting



These 1995 graduates of the J.L. Kellogg Graduate School of Management span all MIT classes from 1985 through 1990. Pictured in front of Northwestern's Deering Library are (l to r, from top): Conrad Winkler, '88; Anne Law, '90; John Martin, '89; Neil Hamblin, '85; Susan Gertzis, '86; and Scott Danielson, '87. Not shown: Dimitri Kazarinoff, '85, and Mike Donohoe, '88.

as a research scientist at the Space Science Center at the U/New Hampshire. . . . **Michael Rechin** is living in Chicago and working as a real estate attorney for Mayer, Brown & Platt. Michael is engaged to Elena Hanoian; they plan a June 1996 wedding. Michael hangs out with other Beta alums: Ken Bryan, '88, Earl Jay Watkins, '90, John Springsteen, '91, along with "the constant stream of Betas who call my floor 'home' for a day or two as they pass through Chicago."

Rachel Kaminer and husband Brian Gebhardt write to announce the birth of their first child, Aaron Gebhardt, born December 1, 1995, weighing 8 lbs, 5 1/2 oz. . . . **Robie Silbergleit**, '88, **Joe Orso**, **Ann Mailhot**, husband John, '88, and son J.C., attended the baby-naming ceremony last December 17. J.C. is now a year old, and is walking, while Robie is doing a fellowship in emergency medicine in Washington, D.C. Joe was delayed, as he had gotten engaged the day before. . . . **Anh Thu Vo** wasn't able to attend, having just moved to Chicago for a new job. On being a new mother, Rachel writes "I am completely sleep deprived because of Aaron. It's worse than any finals week I ever had at MIT."

Tibor Toth and wife Jennifer had their second baby, "a beautiful baby girl named Katherine, on November 15. Our two-year-old, Alexander, adores her and is doing very well himself." Tibor is still working with a small leveraged buyout firm in Boston, Lee Capital Holdings. "We completed the acquisition of a hotel foodservice business this year, of which I am on the board of directors and have spent a great deal of time advising on strategic and financial issues. We are always on the prowl for exciting management buyout (as their equity sponsor) and growth capital opportunities. We would love to hear from other classmates who pass through the Boston area," Tibor writes. . . . **David Goldstone** writes, "Some of the first amendment work I did related to the prohibitions on tobacco advertisements got picked up by *Business Week's* January 15 issue. Otherwise, I have been working on an analysis of a proposed SEC rule to make the NASDAQ stock market more efficient, and a First Amendment challenge to the National Park Service's prohibition of the sale of T-shirts on the mall in Washington, D.C."

Angeli Salgado Maney writes that she and husband Bill went on a three-and-a-half-week tour of Hong Kong, Thailand, and the Philippines in November of 1995. "We both liked Hong Kong. All the rumors about traffic are true. But we managed to get away from the city. We stayed in the northern part of Thailand (Chiang Mai) for a couple of days, then headed to the beach on Phuket Island, which was beautiful. We also toured the Phi Phi Islands and went to Phra Nang Bay, where we hired a guide and equipment for a full day of rock climbing. That was the most amazing part of the trip! Climbing right on the beach was awesome. We also saw a little bit of the Philippines, which was our final stop. Highlights include: three days on Boracay Island, a helicopter ride to Mt. Pinatubo volcano, which erupted in 1991. The crater was an amazing sight! The ash flow (lahar) covers the town of Bacolor and some farmlands. We also saw some damage from the typhoons Rosing and Angela. Some towns were still flooded a few weeks later." Angeli is still having fun

being self-employed, doing tax returns and pension plan consulting. April 16 is the best day of the year!" Also, Angeli and Bill's Annual Ski Trip with Baker House folks was in Aspen, Colo., the beginning of January. Attendees included: Dan Mittleman, '88, and his wife Vicki, **Mark Coiley**, his girlfriend Julie Cheney, **Joe Landry**, '88, **Phil Kuhn** and his fiancée Jenny Watson-Williams, and **Steve Payne**. "Bill and I are really into snowboarding now. We go down the black diamond runs but we haven't gotten into doing tricks yet. I followed Phil, Dan, and Bill through the trees on this trip, and did OK. Only got stuck once when a tree 'grabbed' me."

Christy Alvord is back in the U.S. and living in Dallas, where she is working for McKinsey again. Christy worked in Poland through most of 1995 and then traveled in Eastern, Central, and Western Europe before returning to the U.S. for Christmas, where she started work a week and a half later, "just in time for the annual office retreat (I may not have rhythm but I do have timing!)." . . . **Patrick O'Hefferman**, who, combining his position as director of foundation relations and adjunct professor of international affairs at Georgia Tech has opened some interesting doors. "Last year I was able to test the theory described in my dissertation and subsequent book, i.e., that media can have specific effects on international policy making," Patrick writes. Patrick raised \$250,000 in cash and \$3 million in free TV time and created a series of 16 PSA's that ran on CNN, BBC, and other networks worldwide, advocating certain positions at the Cairo Conference on Population. The "talent" were heads of state, celebrities like Jacques Cousteau, and ordinary volunteers in the trenches around the world. The campaign won an Emmy and three Telly Awards for the best PSA campaign of 1995. The campaign was only the second time in history that a PSA campaign was broadcast worldwide; the first time was another campaign Patrick produced for the Earth Summit in 1992.

My big news is that I recently got engaged, to Lisa Cocco. Lisa is working as a part-time engineer at Polaroid, and should be finishing a master's in MechE this spring at Tufts. We haven't set a date yet, but it will likely be Spring 1997. Well, that's it again for this month. Many more members of the class have home pages, so be sure to check out the '89 home page at <<http://www.tns.lcs.mit.edu/mit89/>> and send your URL if you have some info. Please send in news!—**Henry Houh**, secretary; 4 Ames St., Cambridge, MA 02142; tel: (617) 225-6680; e-mail: <hjh@mit.edu>

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Let's get right to business! **Laura Scolnick** sent me a nice e-mail replete with swim team information: "I'm at UPenn finishing up a PhD in biological chemistry. UPenn is OK, although I'd say overall the student population at MIT is a funner group. I do like Philadelphia as a city, however. I saw **Yvonne Grier**, **Jenny Snyder**, and **Michelle Quinton**, '89, in October at Jen's wedding. They all seem to be doing well. That same weekend I also saw **Karen Fu** and **Josh Wachman**, who are back at MIT for grad school. As for other MITers, did you know Billy Gordon, '87, was out there in San Fran? Elizabeth Greyber, '89, is also there.

ClassNotes

Grace Tseng is in a master's program at Stanford, which is some sort of combination of design and business."

Tiffany Bowles writes: "I went to Georgia Tech for an MS in Aero-Dyn and Control—right after MIT. Atlanta was very different from New England, and Tech was very different from MIT. It made me really appreciate a lot of stuff at MIT, just some basic student rights/freedom that we took for granted. I enjoyed myself, got involved in some campus politics, but decided that a PhD was not for me. I moved to L.A. and took a job at Hughes Space and Comm." She says that she really liked the job—especially the international assignments and business-class travel to places like Hong Kong and Tokyo—and even managed to survive the "aerospace depression." Now Tiffany has moved over to government projects and is working on the design of a payload control system. "I am the 'lead engineer' and am getting to do all the system and subsystem engineering and am really enjoying the project. I see **Sandy Serkes** every now and then; she's married to **Aaron Goodman** and they just bought a house in Watertown, Mass. I also talk with **Matt Fox** every now and then. He's had business in L.A. once or twice. If you know anyone who needs a job, HSC is hiring big time!"

Amy Meyers, '89, tells me that she graduated from HBS in '94, and that she enjoys living in D.C. and working as a management consultant. . . . From **Peter Gordon**, this happy announcement: "Getting married September 15, 1996 to Diana DeCaro of Arlington, Mass. We met at work at Wolf, Greenfield & Sacks, P.C., an intellectual property law firm in Boston. (I've been there since 1990). **Brian Hunter** will be my best man. We just bought a house in North Andover, where Diana and I will settle. I passed the Massachusetts bar exam and was sworn in December 1995." Peter's work is primarily in obtaining patents for software-related inventions.

Anne Law has just graduated from the Kellogg Graduate School of Management at Northwestern with seven other MIT alums (see picture) and "did the safari thing in Kenya and Tanzania for three-and-a-half weeks with Kellogg friends. I'd highly recommend a visit to East Africa—beautiful scenery and great adventures! In August 1995, I started working for the O'Hare Sheraton as executive assistant manager." . . . Also **Katherine (Williams) Derbyshire** sends the following: "I was hired as senior technical editor of *Solid State Technology* magazine in May 1994. Since then, I've been traveling a lot, running into lots of MIT types (lots of brass rats in Silicon Valley). At the beginning of this year, I was promoted to executive editor—a little bit more money and a lot more work. Meanwhile, my husband and I bought a beautifully restored 1890 colonial in Stoneham (just north of Boston), so we're broke, but happy and comfortable."

Monica Niles, '91, program coordinator of MIT's Young Alumni/ae and Parent Programs, notified class president **Eric Miller** that Neal Addicott, '97, a junior from Ashland, Ore., is the 1995-96 recipient of the Class of 1990

Lori Berenson, '91, a former resident of Fenway House who took academic leave from MIT after three semesters to study first hand the peoples and culture of South and Central America, has been sentenced to life imprisonment by a secret military tribunal in Peru. We will have an update on Lori's plight and efforts to intercede on her behalf in the July issue. In the interim, classmates may want to access an informational Web page at <http://www.tiac.net/users/salem/lori_berenson>. Letters, in Spanish only, may be sent to her addressed to Lori Berenson, Yanamayo Prison, Puño, Peru, South America.

Scholarship Fund. Neal has a GPA of 4.8 and is majoring in civil and environmental engineering. In the summer he worked for the environmental action group, MassPIRG, and he is thinking of a career in environmental management. Neal also does private voice study and performs in MIT's Chamber Chorus and in the Gilbert and Sullivan Players, for which he is the secretary. Annoying though those pesky prods for funds from MIT are, they serve a noble purpose—helping students like Neal.

As for myself, I've been enjoying law school, and I'm probably working somewhere this summer though I haven't the foggiest idea where, since it's freakin' February as I type this. Wishing you all a terrific summer, please send news to: **Max Ochoa**, secretary; 10726 Red Arrow Hwy., Bridgman, MI 49106; tel: (616) 465-3257; e-mail: <mchocha@leland.stanford.edu>; <mit1990@mitvma.mit.edu>.

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Mohanjit Jolly is "happily single," working for Itek Optical Systems, and living in Cambridge.

He has worked at Itek since graduating with his master's in aero/astro in 1993. . . . **Andrew Parsons** is a first-year graduated student in the cell biology department at UVM. UVM is located in Burlington, which Andrew calls "prime ski country." When he's not skiing or studying, he is a member of the 272nd Chemical Company, a Massachusetts National Guard Unit in Woburn, Mass. He remarks, "Fortunately, it looks as though I will not be sent to Bosnia for peacekeeping duty." . . . **Dirk Karis** works at Oracle with 10 other MIT/Epsilon Theta alums, though he "hardly see[s] them among the thousands of people." He is the technical lead for an "over-worked group supporting a leading-edge software development tool." Dirk has recently taken up hang gliding and has already received his Hang-2 rating.

Lindasusan Ulrich spent three weeks in Amsterdam last year, "almost all of it in the Van Gogh Museum. Beautiful city, wonderful museums." Last spring, Lindasusan and the UC/Berkeley Chamber Chorus toured the East Coast with a program of Ukrainian and Russian music, and at their stop in Washington, D.C., the Ukrainian ambassador was in attendance. Lindasusan sings with several other

groups, including her backup group, the Total Babes. . . . **John Piscitello** plays string bass for the New England Philharmonic, and works in Boston for Mark of the Unicorn, Inc., where he is director of online services and writes music software.

Alex Min sends us news about himself and several classmates. Alex enjoyed an "exciting six months" on his first overseas deployment to Japan and Korea. Of his visit, Alex writes, "While I was in Okinawa, I got to shoot an AIM-9M 'Sidewinder' missile. It was in Korea, a full-bird colonel picked me for some translating/interpreting." Alex writes that **Laura Moore** is out of the Navy and splitting her time between Georgia and Massachusetts and is, in Alex's words, "just as curious, robust, and gutsy as ever!" . . . **Belinda Schmolke** still works for IBM in South Africa, where she has "found time for photography, love, and long letters to dear friends." . . . **Charlie Freeman** is studying in Rochester, N.Y.

Kristin (Slanina) Schondorf is still enjoying her work at Ford, where she is a component engineer responsible for the design and release of the 3.8L/4.2L cylinder head. Her most recent adventure was a "wild and crazy white water rafting trip on the Class V Upper Gauley River in West Virginia with Steven Schondorf, '88, and friends. I was thrown out twice, but managed to survive with only a few bumps and bruises—and it was worth it!"

Kris Newton and **Chris Klein** were married in the summer of 1994. Chris then began an architecture master's degree program at the Harvard School of Education in June 1995, and continues to teach physics at Cambridge Rindge & Latin school, where she has worked since graduation. . . . **John Kimble** is starting his fifth year as a consultant in Greenwich, Conn. He sends a message to those whose work involves travel, "Let me know if your job requires your being in Mexico City as well—we'll do dinner."

Please send your latest news to: **Andrew Strehle**, secretary, 59 Commonwealth Ave., Apt. 4R, Boston, MA 02116; tel: (617) 450-0637; e-mail: **Renee (Mong) Miller**, <miller-rl@post7.laafb.af.mil>

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Barrett Pappas is in business school at Stanford. In addition to studying for an MBA, she is working on a master's in manufacturing systems engineering. (It's like MIT's

LFM program—two years, two degrees). **Susan (Serkes) Lotwin**, '92, and **Rachel Obstler**, '92, are also in her B-school class. . . . **Darren Frechette** is finishing a PhD in economics at North Carolina State University. . . . **Chrissy Kwon** writes, "If all goes well for me, I'll be in NYC for another four years." Chrissy is currently applying for ob/gyn residencies. She spoke to **Christine Ma** during Christmas who is planning a year off from med school to travel across Africa. As for other updates, Chrissy mentioned "the upcoming weddings of **Stacy Holander** to her boyfriend, **Bob**, in May and of **Barb Sigmund** to her longtime boyfriend, **Nyden**. I also got a photo Christmas card from **Denise** and her son **Tyler**, who is growing up very fast. What a cute little boy!"

Debbie (Min) Kwon works for Disney Development Co. and says, "It's truly 'the happiest place on earth!' Well, almost." . . . **Lisa (Arel) Hammer** is planning to do a pediatrics residency and is in the process of interviewing now. She may take a year off to get a master's in public health. . . . **Cindy Evanko** is enjoying the research she is working on towards a PhD in environmental engineering, with another two years or so to go. . . . **Brian Hines** is also interviewing for ob/gyn residencies. . . . **Sunny Ahn** is in Korea for a year to become more fluent in Korean and spend more time with his family.

Reuben Lerner writes, "I figured that it was about time for me to contribute to the Class Notes section. I've been waiting for my life to stabilize a bit before submitting anything, but things have been rather hectic in the last year, and they look like they're going to remain hectic for the foreseeable future, so I might as well give you an update now: In May '95, I left my job at Hewlett-Packard in Andover, Mass., and began working for Time-Warner's Pathfinder site on the World Wide Web. Imagine my surprise when **Ron Scharf** and I discovered that we were working in the same building that summer! In June, I participated in the annual meeting of the World Zionist Congress in Jerusalem, where I saw **Shifra Teitz** and **Mike Franklin**, '88. Shifra is studying at the Weizmann Institute in Rehovot (just south of Tel-Aviv), and Mike was in the country on one of his many worldwide jaunts. Then, on December 4, I finally immigrated to Haifa, Israel, where I am slowly setting myself up as an independent Internet/World Wide Web consultant, helping people get hooked up to the Internet and writing programs for Web sites in Israel and abroad. It's quite amazing to see how computer-centric Israeli industry has gotten in the last few years, but I'm certainly not upset by this trend! The immigration process has been chaotic but fun, and a large number of people have already stayed with me when passing through Israel or Haifa. Anyone planning to visit should contact me at: <reuven@netvision.net.il>; I'm always happy to show people around!"

Thanks for all the mail folks. And all you e-mailers—if you have suggestions on how to send word to you and others, please feel free to send me information. I am still learning all the tricks of the e-mail trade. Send your news to me.—**Leslie A. Barnett**, secretary, 2644 Vrain St., Denver, CO 80212; tel: (303) 433-4476; e-mail: <labarnet@ouray.cudenver.edu>

As I write this column it is mid-February and cold outside. Hopefully, by the time you are reading this in *Tech Review*, the cold and snow of the winter will be but a

distant memory.

Yoshi Ito was planning to finish a master's in city planning at MIT in March this year, after finishing his thesis. It's taken him two-and-a-half years to finish the two-year program because he spent 10 months at the University of Tokyo Faculty of Urban Engineering in 94-95 doing I/S and census-related research. In April, Yoshi expects to start work at Taisei Corporation in Tokyo, a firm that offers engineering, architecture, development, and general contracting. Yoshi reports that fellow classmate, Michael Kim has been in Japan since graduation, where he has been working at United Technologies Research Center, Japan. . . . Jim Lee is in the first year of University of Chicago's MBA program, where Jeff Meyer, '90, and Amy Chiang are enrolled as well. . . . Eric Ask is in Macon, Ga., working for GE. . . . Jim Haid, who also works for GE, is in Albany, N.Y.

Terry Wong is still living in Boston, working for Andersen Consulting. He's been spending a lot of time on information-technology strategy and operations development for a large financial services client here in town. . . . Andy Howe has been learning to snowboard and do a single axle on ice skates. While indoors, Andy has been making Shaker style furniture. "Anyone out there wish to start a Shaker furniture company company with me?" . . . Kathy Kostival is still at Cornell doing a PhD research in food chemistry in the area of fat replacement. (You know, that stuff that SnackWells cookies don't have! Kathy actually knows the guy at Nabisco who created SnackWells.) Other than that, her minors in business administration and nutrition are keeping her busy. . . . Tim Kutscha is having a blast in the Bay Area after working there one-and-a-half years. He's gone backpacking several times over the past year and built a snow shelter, too. Church and the Hewlett-Packard Symphony Orchestra take up the remainder of his time.

On his trip to visit family in Jamaica last Christmas, Laurence (Larry) Ward saw Kathy Howe. It was quite a surprise since, while at MIT, they ran into each other about once a year, and she is from the States. Kathy has been in Jamaica for a year and a half, volunteering at a high school near Kingston, the capital city. Larry also saw John-Paul Clarke, '91, SM '92; Michael Clarke, '92, SM '94 (yes, they are brothers); Wayne Stewart, '92, and Marlene Smith. They were some of the people attending a Jamaican MIT alumni/ae get-together. . . . After working at a pharmaceuticals company for two years, Sarah Wheeler decided she'd rather teach high school chemistry, so she's mid-way through a certification program. By the time this appears in print, Sarah will be in charge of two classes at Brookline (Mass.) High School. She's still deciding whether she'll get more respect appearing young and "hip" or more like an old maid. . . . Mark Aude recently finished his first year of work for Intelligent Automation Systems of Cambridge, Mass. IAS designs and builds custom automation equipment, but it also produces ultra-high throughput PCR sys-

tems, instruments for DNA research, and a rapid-imaging 3-D laser metrology device known as the 4DI. Aside from work, Mark can't wait until it gets warm again so he can go back to camping and rock climbing on the weekends.

Chay Kuo writes, "Now I know what it feels like to be a graduate student: living in a lab, working on experiments all day, slaving away on a thesis, while being paid less than illegal immigrants." Chay just passed the PhD qualifiers, and his research is picking up a full head of steam, so he hopes to be back in medical school shortly. Even so, his classmates will most likely be attending physicians by the time Chay starts his rotations. . . . Ruth Hwang is still a manager at Oracle, where she is also captain of a recreational volleyball team. She moved to San Francisco and lives in a "really cool apartment." . . . Ben Wen started a software company, ThinkFish Productions, with Rolf Rando, '95, and a couple of designers from the Rhode Island School of Design. They moved to San Francisco in July, and Ben is getting assimilated into the California life. He borrowed some in-line skates, bought a motorcycle, and plans to take hang-gliding lessons. He's also taken up bowling—every Sunday at 9:30 at Rock and Bowl on Haight Street.

Jane Bae is in her second year in medical school at NYU. Theresa Park, Shannen Moynihan, Savita Mohan, '94, Raneer Mehra, '95, and Heather Lee, '95, are also attending NYU med as well. Jane recently saw Quyen Chu (working for Solomon Brothers), Eleanore Kim (second year at University of Illinois/Peoria), Julie Lew (at Ernst & Young in Virginia), Aoy Tomita (MIT PhD program in toxicology), Julie Chang (at Abbott Labs in Chicago), and Carmen Perez de la Cruz (at Hughes Labs in California) for a New Year's Eve reunion in Boston. It would be great to get some pictures for *Tech Review*, if you have any! . . . Jim Hansen is trying to make sure he has funding to go on for a PhD in the water-resources group at Stanford. He's having a great time in the MS program this term, honing his analytic chemistry skills, and getting into a lot of microbiology. Jim's wife, Cathy Lachapelle, '92, is still working through a PhD in a psychological studies in education program. Their elder son, Colin, is now in kindergarten and being a great 6-year-old kid. The younger, Cael, just turned 18 months and is starting to talk.



The July 1995 wedding of Katy Evanco and Brian Brown, both Class of '93, included a sizable contingent of their classmates and other MIT alums. Front row, left to right: Mary Motto, Lisa Oliveira, '90, Nancy Schonendorf, Becky Wittry, Katy and Brian Brown, Stuart Schaefer, Todd Riggs, '92, Dirk Bernold, Todd Sachs, '90, Stefanie Smith, Doug Smith (with little Doug), and Beth Henderson, '92. Back row: Nate Kalich, Roger Kermode, SM '94, Cris Dolan G, Tony Gonzales, Lori Swenson, Clay Staneck, Warren Chuang, '96, Martin Calles, '97, Kevin Mullican, Kent Hanson, Chad Spooner, Mark Driscoll, '92, Kimball Thurston, '94, Ken Vollmer, '95, Carrie Miller, '95, and Tony Lu, '96.

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After a 10-month hiatus, Michael Cabot is back in Japan, this time for P&G in Kobe, working closely with Shen-yi Sieh. After doing marketing and technical sales for his old company, Michael says it is nice to be doing real engineering work again. He has begun working with a foreign Boy Scout troop, which takes up a big chunk of his time. If anyone is in the area and needs a place to stay, give him a ring. . . . Hanh Le is settling into California life, working at Lockheed Martin Missiles & Space here in Sunnyvale in satellite engineering, doing dynamics analysis for mechanisms. She has been working here since July 1995, after graduating from Stanford with a master's degree in biomechanical engineering. Hanh still sees John Feland, Christine Harada, and Yoli Leung, all '94, and Shin John Choi, every now and then, since they're also in the Bay area (along with TONS of other MITers). She also sees Karl Leeser, who has just moved out here to work after finishing a master's at MIT. Hanh is also playing ice hockey with the Northern California Women's Hockey League, where she sees teammate Alissa Fitzgerald, '90, all the time. Alissa is the housemate of Kortney Leabourne, '92, and they're both at Stanford for grad school in aero/astro. . . . Wayne Kuang is also at Stanford, where he is in his third year of medical school.—Mari Madsen, secretary, 85 Alberta Rd., Brookline, MA 02167; e-mail: <mmadsen@opal.tufts.edu>

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Please send news for this column to: **Jeff Van Dyke**, secretary, 6000 Shepherd Mountain Cove, #1401, Austin, TX 78730; e-mail: <jvandyke@lcs.mit.edu>

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Before diving into the Notes for this issue, I wanted to remind all of you to send in your pledge money for the class gift. It must be received by June 30 to qualify for the

current fiscal year. Remember that we are supporting a great cause—the Class of 1995 UROP Scholarship is already helping one student; hopefully, the fund will grow so we can support many more.

Thanks to **Fouad Saad**, who sent me a great update on many of the people who are currently in the MIT Chem Engineering Practice School. After his trip to the practice-school stations this summer, Fouad's fate seems as of yet undetermined, but it will probably consist either of working in engineering as he was trained to do or going off on a tangent into the realm of public policy or government. . . . **Brett Bader**, **Marcus Frank**, and **Ian To** have headed off to practice-school stations for this term, and will be receiving master's degrees in June. . . . After finishing practice school this summer, **Anna Chwang** will be leaving MIT to attend University of Minnesota, where she plans to pursue a PhD in chemical engineering. She says: "Boston winters aren't bad enough for me; I want more snow!"

Many people are still in and around MIT

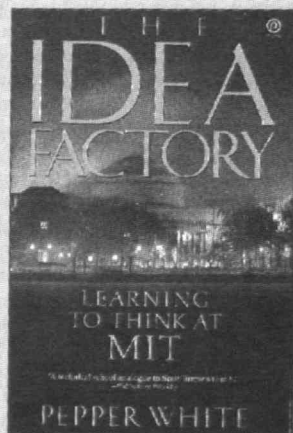
this year: **Stephanie Shaw** says that she was "one of those sick people who decided to stay on at MIT," but she did switch departments. She is currently a grad student in the Center for Meteorology and Physical Oceanography in EAPS and plans on getting a doctorate in atmospheric sciences. . . . **Steven Johnson** is back in the graduate program in theoretical physics. . . . **Stephen Lin** and **Dexter Mootoo** are both in the master's program in mechanical engineering. . . . In Course VI, **Tim Derksen**, **Manish Muzumdar**, **Ray Tai**, and **Edward Tau** are all pursuing graduate studies. Ed is currently working in the AI lab doing research on a dynamically programmable gate array for which a patent was filed in January 1995. . . . **Jesse Hull** and **Mark Story** are back from their VI-A internships on the West Coast. Jesse was working at Xerox PARC, and is now finishing his thesis and living with **Arte Merritt**, '96. Mark, who was working for Tektronix in Oregon, will be staying for two terms to finish his thesis. . . . Also back from a VI-A internship is **Sahana Sarma**, who was working for Motorola in Schaumburg, Ill. Sahana got together with **Jahnavi Swamy** (working at Procter & Gamble in Cincinnati), **Ish Modak** (at UT/Houston medical school), and **Damon McCormick**, '94, for a New Year's Eve celebration in Chicago. They all visited the sites and enjoyed exploring the city.

Nicole Gotti has returned to MIT after her internship at the Los Alamos National Lab, and is now completing work towards a master's in environmental engineering. **Nicole** and **Edward Hernandez**, who lives in Blacksburg, Va., and works as a production engineer for Hoechst Celanese, were engaged on January 1

and plan to marry on November 30 this year. . . . **Tresa Vidayathil** is back at MIT to finish her last term, and is currently living with **Miranda Fan** off campus. . . . Also finishing up his last term is **Joseph Baca**. . . . **Morgan Slade** is in the fifth-year master's program in materials science, and **Janet Woods** is currently working at the MIT Language Lab and living with **Jim Gouldstone**. . . . After finishing his MNG degree, **Hung-Chou Tai** plans to work for a small startup company. . . . **Sherry Wu** is currently finishing a master's in nuclear engineering and is looking forward to starting work at the Nuclear Regulatory Commission in Washington, D.C., this summer as a general engineer. . . . In July, **Yeh-Jiun Tung** will be leaving Lincoln Labs (where he is doing work related to Theater Missile Defense) for UC/Berkeley, where he will begin a master's in EE. . . . **Rich Damaso** recently returned from Chicago (where he was a singing waiter) to Boston and is now working with **Will Lee** at the Whitehead Institute. . . . **Rebecca Hill** is working as a research assistant in the memory disorders group at the VA hospital here in Boston and applying to medical schools. . . . **Ken Lin** will be working at MGH in the Molecular Biology Department for a month and then will be attending the Berklee School of Music. After that Ken expects to go to grad school in botany at UT/Austin. . . . **Steve McNamara** is pursuing a PhD in economics at Harvard, while **Alex Peterson** is in the PhD program in chemistry at George Washington University.

More on the school scene: **Jessie Browning** is in medical school in New York City, and **Anna Fortunato** is in grad school at the Col-

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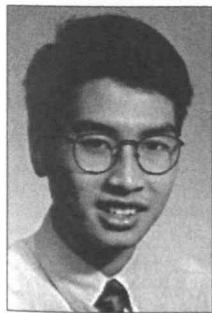
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lege of Physicians and Surgeons at Columbia University in the integrated molecular, cellular, and biophysical studies program. . . . In UPenn's Materials Science and Engineering Department, **Joyce Espiritu** recently found a husband-and-wife thesis advisor team of Dr. Russell Composto and Dr. Karen Winey. She will be working with them on a phenomenon known as dewetting. Joyce was a little disappointed that she missed the Blizzard of '96, since she was in Guam and the Philippines at the time, but I have the feeling that she's gotten her fair share of snow since! . . . Out in California, **Andrew Kim** is enjoying wine, fun, and the Pacific Ocean while working towards a PhD in electronic materials at Stanford. . . . **Mariah Manzanarez** is attending UC/San Francisco's medical school, while **Jose Mur-Miranda** is doing a master's at Stanford. Jose plans to return to MIT to do a PhD in EE after finishing up at Stanford. . . . **Colin Page**, who is currently at Georgetown Law School, recently got engaged to Jennifer Minnerly, a grad student at Boston College. . . . **Chadwick Trujillo** is at the University of Hawaii, Institute for Astronomy, pursuing a PhD in astronomy/astrophysics. . . . **Andrew Carnell** was commissioned as ensign in the U.S. Navy and is going to flight school to be a naval aviator.

Although many in our class decided to stay in school, a sizable number went into the workforce as well: **Robert Barrimond** is a participant in the engineering-leadership development program at Lockheed Martin Corp.'s Management and Data Systems. . . . **Derek Cedillo** is working for GE Aircraft Engines while **Rebecca Fahrmeier** is at Comsat Labs in Maryland. . . . **Garlen Leung** joined GE



Garlen Leung

Research and Development Center as a materials scientist. . . . In New York City, **Nancy Ho** is working for New York Consulting Partners. . . . **Jock Jones** is an analyst for Lehman Brothers, and **Jeffrey Schwartz** is working for Japonica Partners in Rhode Island. . . . In the Boston area, **Ketaki Patel** is at Raytheon, and **Paulo Pereira** is living in New Bedford, Mass., and working as a customer support engineer for Teloquent Communications, a computer-telephony firm located in Billerica. Paulo's play *Amarelo* was produced on campus last fall, directed by Dr. Brenda Cotto-Escalera of the MIT Theater Arts faculty. When Paulo was writing to me, he was on the phone with **Richard Davis**, who is now on the "left coast" working at Intel. Richard says he's "living the life of a Q&R grunt" and describes San Jose as being "flat, crowded, and smoggy," but invites Paulo to come join him there. (Paulo declined, saying he'd "take blizzards over earthquakes anyday!")

Also on the West Coast: **Brian Carlstrom** is working for General Magic in Sunnyvale, Calif. . . . **Jennifer Tschudy** is working at Jet Propulsion Laboratory, and **Quoc Tran** is currently in transit from one job in Chicago to another closer to his home near San Jose.

Puzzle

Continued from Page MIT 55

21. $19A, 49155, = 45z10 + 4nn5$. Only two possibilities are $(809 \times 5 = 4045)$ and $(829 \times 5 = 4245)$. So $13A$ is 809 or 829 . Assume it is 829 ($t = 2$). Then $24A$ becomes 92 and $31A$ becomes 4501 . $28A$, a factor of $24A$, would have to be 23 or 46 ($u = 2$ or 4). But by $13A$, $829 + (7429 \text{ or } 7449) = 2n13 + xy05$ (z would be zero because of $19A$ $49155 = 45z10 + 4245$). Both are impossible. Thus $t = 0$, $13A = 809$, $24A = 90$, and $31A = 4511$.

22. By $13A$, $809 + 74u9 = 2n13 + xy15$, so $u = 1$, $16A = 7419$, $9D = 1015$, and $20D = 10151$. Now $809 + 7419 = 8228 = 2n13 + xy15$. Looking back at step 8, $23D$ must be 2113 or 2413 . If it's 2113 , $25D$ becomes 6115 and $28A$ becomes 11 . But 11 is not a factor of 90 , so $23D = 2413$, $25D = 5815$, $28A = 18$, $26A = 5847$, $14A = 786$, $2D = 808$ and $17A = 101$.

1996 Jan 1. Now that you have just solved the yearly problem, take a crack at this variant from Philip Jacobs, who wants you to find numbers that can be formed using their own digits in a nontrivial way. That is, we do not want a trivial solution like

$$128 = 128$$

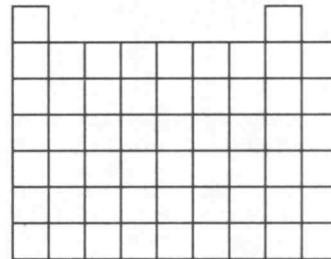
but do want the solution

$$128 = 2^8 \cdot 1$$

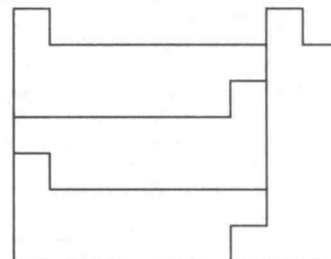
Several readers noticed that using exponents is a key and many claim that there are an infinite number of solutions (but I did not see any try a formal proof). **Charles Rivers** found the following string of 47 out of 48 consecutive numbers that can be so expressed, suggesting that there are indeed an infinite number of such solutions:

117622	$7^6 - (2+1)^{(2+1)}$	117638	$7^6 -$	117654	$7^6 + 1^{15} + 4$
117623	$7^6 +$	117639	$7^6 -$	117655	$7^6 + 1^{15} + 5$
117624	$7^6 -$	117640	$7^6 -$	117656	$7^6 + 1^{15} + 6$
117625	$7^6 -$	117641	$7^6 -$	117657	$7^6 + 1^{15} + 7$
117626	$7^6 -$	117642	$7^6 -$	117658	$7^6 + 1^{15} + 8$
117627	$7^6 -$	117643	$7^6 -$	117659	$7^6 + 1^{15} + 9$
117628	$7^6 -$	117644	$7^6 -$	117660	$7^6 + 1^6 + 10$
117629	$7^6 -$	117645	$7^6 -$	117661	$7^6 + 1^6 + 11$
117630	$7^6 -$	117646	$7^6 -$	117662	$7^6 + 1^6 + 12$
117631	$7^6 -$	117647	$7^6 -$	117663	$7^6 + 1^6 + 13$
117632	$7^6 -$	117648	$7^6 - 1^{14} 8$	117664	$7^6 + 1^6 + 14$
117633	$7^6 -$	117649	$7^6 + 1^{14} 9$	117665	$7^6 + 1^6 + 15$
117634	$7^6 -$	117650	$7^6 + 1^{15} + 0$	117666	$7^6 + 1^6 + 16$
117635	$7^6 -$	117651	$7^6 + 1^{15} + 1$	117667	$7^6 + 1^6 + 17$
117636	$7^6 -$	117652	$7^6 + 1^{15} + 2$	117668	$7^6 + 1^6 + 18$
117637	$7^6 -$	117653	$7^6 + 1^{15} + 3$	117669	$7^6 + 1^6 + 19$

Jan 2. This problem appeared in Solomon Golomb's puzzle column in Johns Hopkins Magazine. You are to dissect the figure below into four congruent pieces.



Ken Rosato and **John Boynton** each found the following solution.



Other Responders

Responses have also been received from **R. Anderson**, **C. Bahne**, **R. Bart**, **Rev. M. Buote**, **R. Campbell**, **D. Church**, **J. Datesh**, **M. Fountain**, **R. Hess**, **D. Hopkins**, **A. Ornstein**, **D. Plass**, **S. Portnoy**, **C. Rivers**, **J. Ryan**, **R. Sackheim**, **D. Savage**, **L. Schaidler**, **A. Silva**, and **J. Varnick**.

Proposer's Solution to Speed Problem

Ferrous wheel, **Orthodox**, **Paradox**, **Hexamethylbathroomtile** (what do you expect from a Course V man?).

Quoc is happy that he is finally returning to warmer climates and looks forward to his new job, but he sure could use a roommate out there! . . . And to finish up the rest of the country: **Amy Swanson** is working as a production engineer at Honeywell Inc.'s Home and Building Control Division manufacturing plant in Golden Valley, Minn.; **Jefferson How-**

ell is at Allied Signal Automotive in Dearborn, Mich.; and **William Zhou** is at AT&T in New Jersey.

That wraps up this column. As always, please send me info/pictures/comments/questions!—**Ranjini Srikantiah**, secretary, 21 Beacon St. Apt 2T, Boston, MA 02108; e-mail: <srikantiah@idx.com>

CourseNews

CIVIL AND ENVIRONMENTAL ENGINEERING

Mark French, SM '90, writes: "While on leave from the University of Louisville (Kentucky) from January to March, I was in Australia as a visiting scholar at the University of Adelaide. Using artificial neural network models, I worked on water-quality modeling in freshwater lakes and reservoirs. . . . From Honolulu, **Robin R. Cababa, SM '76**, writes: "As the acting commander of the Pacific Ocean division of the U.S. Army Corps of Engineers, I am involved in military and civil works construction in Hawaii and military construction in Japan and Korea." . . . **Kenneth L. Recker, SM '73**, writes: "I am completing a six-year term on the Falmouth (Maine) Planning Board and have recently been elected to the board of the Falmouth Education Foundation (FEF), a nonprofit organization that raises and distributes money for unfunded school and community programs. Last year, the FEF distributed more than \$21,000 in grants."

Jeffrey J. Srivier, SM '95, writes: "I joined Multisystems, Inc., of Cambridge, Mass., as a transportation systems analyst."



Melvin Rubin

Congratulations to **Melvin Rubin, SM '51**, who writes: "I was honored with the most dedicated alumni caller award at the MIT Graduate Alumni/ae Program at their annual volunteer recognition event at the Museum of Science in November." . . .

David C. Freeman, Jr., SM '92, writes: "I married Joan

White on November 17. We intend to return to MIT to pursue PhDs in civil engineering. We are currently instructors at North Carolina A&T State University. . . . **Joseph Burns, SM '81 (I, IV)** writes: "I recently joined Thornton Tomasetti's Chicago office, TT-CBM Engineers, as a director of structural

engineering." . . . **David G. Lutz, SM '85**, and his wife, Lissa, announce the birth of 10 lb., 1.5 oz. Hamud Erik McIntire Lutz on September 26. . . . **Yves M. Giroux, SM '60, ScD '66**, writes: "As the assistant to the rector at Laval University in Quebec, I coordinate information technologies. I am a member of the Atomic Energy Control Board of Canada and former chairman of the board of the Canada-France-Hawaii Telescope Corp. Challenges are the essence of life, MIT prepares well." . . . **Robert Johnson, SM '66**, of Sherborn, Mass., joined Tocci Building Corp., a contractor and construction management firm, as expeditor. His initial assignments include the new \$2.1 million corporate headquarters, the manufacturing facility for Shiva Corp. in Bedford, Mass., and the \$10 million Bear Hill Condominiums project in Reading, Mass. Johnson has nearly 30 years of experience as a coordinating engineer, and holds a BS in mechanical engineering from Rensselaer Polytechnic Institute.

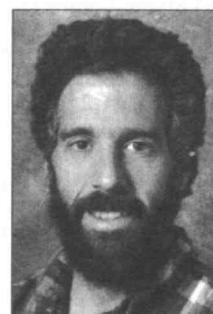
Navy Lieutenant Commander **John H. Edwards, SM '92**, has returned from a six-month overseas deployment while serving with Naval Mobile Construction Battalion One. Edwards is one of 610 Seabees who departed Gulfport, Miss., in early April for Naval Station Rota, Spain. While there, the unit replaced leaky pipes to help conserve water during southern Spain's severe drought and constructed a family service center. With forces from Tunisia, the battalion built an aircraft bombing range. Traveling to the Black Sea, the battalion made improvements to Albania's only trauma hospital. The unit was selected as the Atlantic Fleet's Best of Type.

MECHANICAL ENGINEERING

From Farmington, Mich., **Mary E. Kriz, SM '92**, writes: "I was promoted to senior project engineer at the General Motors Noise & Vibration Center in June 1995. I'm currently vice-chair for the Southeast Michigan section of ASME. I was accepted to the graduate school at Iowa State University for an MS in statistics." . . . From Huntington Beach, Calif.,

S. Gopala Kvishuan, ScD '69, writes: "I was elected a Fellow of ASME in June 1995." . . . **Capers McDonald, SM '72**, writes: "In October, I was elected chair of the Maryland Bioscience Alliance, a cooperative association of nearly 100 bioscience companies located in Maryland. I am the president and CEO of Microbiological Associates, a growing biological safety testing company headquartered in Rockville, Md. Last summer, Microbiological Associates was selected as 'High-Tech Firm of the Year' from among more than 200 company members of the suburban Maryland High-Technology Council."

Bharat Bagepalli, ScD '84, writes: "I am currently working in the engineering mechanics lab at General Electric's R&D Center in Schenectady, N.Y., and am developing advanced seals for turbines to enhance their efficiency. I am married to Jolanta, who is originally from Lithuania, where we often vacation. We have two daughters, Lina Rajili and Inga Aarti."



Anthony Wexler

Anthony Wexler, SM '78, associate professor of mechanical engineering at the University of Delaware, recently received the Kenneth T. Whitby Award from the American Association for Aerosol Research for "outstanding contributions to aerosol science and technology as a beginning scientist."

Wexler has three major projects underway in the field of aerosol science, the study of particles in the atmosphere. The first one involves the source of particles in the atmosphere and their effect on the climate and human health. His second project involves computer simulations of air quality in such locations as Los Angeles, the Eastern seaboard, and Mexico City. Factoring in such determinants as emissions and meteorology, Wexler mathematically predicts air quality under given conditions. He compares his models with the measurements of actual conditions to determine the accuracy of his model.

DEGREE CODES

AE	Aeronautical Engineer
BE	Building Engineer
CE	Civil Engineer
CHE	Chemical Engineer
CSE	Computer Science Engineer
DPH	Doctor of Public Health
EAA	Aeronautical & Astronautical Engineer
EE	Electrical Engineer
EGD	Doctor of Engineering

ENE	Environmental Engineer
MAA	Master in Architecture Advanced Studies
MAE	Materials Engineer
MAR	Master in Architecture
MCP	Master in City Planning
ME	Mechanical Engineer
MET	Meteorologist
MIE	Mineral Engineer
MME	Marine Mechanical Engineer
MNG	Master in Engineering

MPH	Master in Public Health
MTE	Metallurgical Engineer
NA	Naval Architect
NE	Naval Engineer
NUE	Nuclear Engineer
OCE	Ocean Engineer
PhD	Doctor in Philosophy
ScD	Doctor of Science
SE	Sanitary Engineer
SM	Master of Science



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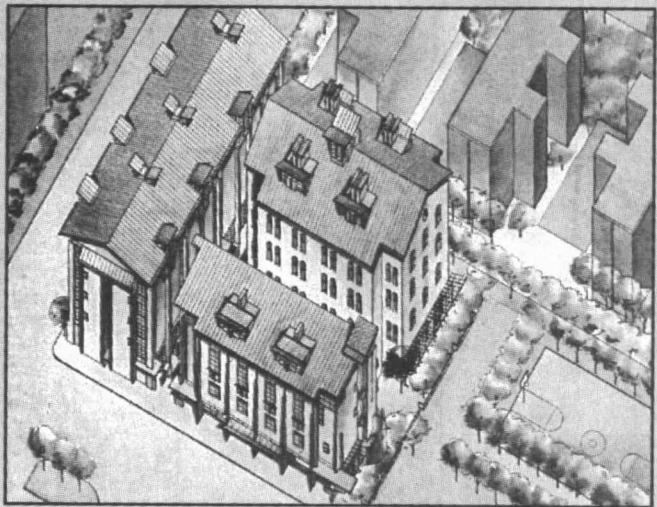
"These regions have serious air pollution episodes, and this research can help predict under what conditions these problems occur, and how emission controls and other steps can improve air quality," he said. His third project involves the development of an instrument to measure particles in the atmosphere. Through a nozzle, the instrument separates particles from ambient gas. An ultraviolet laser ablates and ionizes the particles, and the resulting ions are then analyzed in a mass spectrometer. In addition to these projects in the field of aerosol science, Wexler is using mathematical modeling in biomedical research to learn how kidneys concentrate urine and the effects of ambient particles on human lungs. A graduate of the UC/Berkeley, Wexler received a PhD from the California Institute of Technology. . . . Julie Ann and Michael J. Bear, SM '84, of Old Greenwich, Conn., are pleased to announce the birth of Hannah Elizabeth on October 13. She joins her two-year-old sister, Sydney Rose. Bear is employed by Citibank. . . . Michael Helmick, SM '88 (II, XXII), reports: "Gina and I arrived in Belgium in October after a 'tough' summer in Virginia Beach at the Armed Forces Staff College. Our daughters, Stephanie, 6, and Katherine, 3, are studying in English and French at the International School. I am working in engineering at the Supreme Headquarters, Allied Powers Europe (SHAPE). Our main focus is peace in the former Yugoslavia." . . . Jack Krafchick, ME '68, writes: "I recently completed design and construction activities on the new PET plant expansion for ICI America."

C. Curtis Koch, ME '64, a resident of Cincinnati, Ohio, and manager of Compression System Aero Technology at General Electric Aircraft Engines, has been named a Fellow of ASME International. . . . Dell Computer Corp., a leader in direct marketing of computer systems, named Larry L. Evans, SM '62, ME '66, PhD '68, VP of the company's server group. In his new position, Evans has assumed responsibility for business and program management, engineering development, and product marketing for Dell's server business. Formerly VP and general manager of the products group at Sequent Computer Systems, Evans was responsible for R&D, and manufacturing and marketing the company's server platforms. During Evan's tenure, Sequent's sales grew from \$38 million in 1987 to \$451 million in 1994. Evans also holds a BS in mechanical engineering from the General Motors Institute. . . . *Conceptual Foundations for Multidisciplinary Thinking* by Stephen Jay Kline, ScD '52, was recently published by Stanford University Press. Kline is professor emeritus of science, technology, and values and of mechanical engineering at Stanford University.

MATERIALS SCIENCE AND ENGINEERING

Mark D. Lipsey, SM '78, OCE (XIII), reports: "I have been appointed general manager of maintenance services at the new Hong Kong airport at Chek Lap Kok. I expect to be here for the 1997 turnover to China." . . . Roland Tuck-Chow Choo, ScD '91, has joined Concurrent Technologies Corp. as process analysis engineer in the cast-

Paul Lukez, SM '85, and Akhtar Badshah were recognized with a design award from the New England chapter of the American Institute of Architects for their design of a 63-unit housing complex on Moody Street in Lowell, Mass.



ing department. . . . Robert C. Ruhl, PhD '67, writes: "I am currently VP for engineering at Technology Management, Inc., in Cleveland. Our company is devoted solely to the development and commercialization of a low-cost, highly efficient, solid oxide fuel cell for the production of electric power from fossil fuels."

Siu-Wai Chan, ScD '85, is an associate professor of metallurgy and materials science at Columbia University in New York City. In 1995, she gave a talk on superconductivity at the International Workshop in Maui, Hawaii, and gave an invited talk at Academia Sinica in Beijing, China. . . . From Troy, Mich., Caryl Brown, SM '95 (III, XV), writes: "I am currently working for ITT Automotive as a manufacturing operations specialist in Auburn Hills, Mich. I lead and track process and cost improvement projects." . . . McDonald Robinson, ScD '67, writes: "I am director of Laurence Semiconductor Laboratories in Tempe, Ariz." . . . Kim Kimerling, '65, PhD '69, writes: "At MIT, I am the Thomas Lord Professor of Materials Science and Engineering and director of the Materials Processing Center. My wife, Linda, is a printmaker (monotypes and etchings) in Cambridge. Rachel, 26, is completing a PhD in clinical/research psychology and Samuel, 24, is a chef in San Francisco. Classmates are invited to call me or visit me."

Julian Szekeley, a metallurgist and professor of materials engineering at MIT, died on December 7 in Cambridge. Szekeley, a native of Budapest, was best known for his role in creating mathematical methods to analyze how economics, technology, and the environment are involved in the production of metals. He developed a mathematical model of fluid flow, electromagnetics, and heat transfer in metal processing. He wrote or contributed to seven textbooks and hundreds of papers. His work covered a wide range of subjects, like gas-solid reactions, the flow and mix of fluids in steel processing, and various phenomena in blast furnaces, welding, and electromagnetic processing. His latest research focused on welding and soldering problems in metal processing. He also produced the mathematical model for a micro-gravity experiment that was performed on a

space shuttle last year and is to be done again in 1997. In August, Szekeley helped organize a meeting in Austria of top steel executives at which the future of steelmaking was debated and contacts were sponsored among equipment manufacturers and steelmakers around the world. Szekeley was a 1959 science graduate of Imperial College in London, where he also earned a PhD in chemical engineering in 1961. He taught at Imperial College before coming to the United States in 1966 to join the faculty of the State University of New York/Buffalo. He became a professor in the department of materials science and engineering at MIT 20 years ago.

IV **ARCHITECTURE**

From Cambridge, Mass., Elizabeth A. Chapman-Manny, MAR '81, writes: "I am president of a small architectural firm focusing mainly on single-family residential work and public housing." . . . Michael A. Sokolov, SM '90, writes: "I recently started working at DEC's Cambridge Research Lab." He was expecting the birth of his third daughter in January. . . . Russell L. Greenlee, SM '88, writes: "For the past two years, I have been a user-interface software developer for U S West's Omaha Video-on-Demand trial." . . . Sally W. Harrison, MAR '79, writes: "I am an assistant professor of architecture at Temple University and a principal investigator for a U.S. Department of Education grant on community design and housing for sustainable inner-city neighborhoods." . . . Jesse K. Miguel, MAR '64, has been named 3-D designer and animation manager for HNTB Corp. in Kansas City, Mo. Prior to this, he was the architectural CADD coordinator for HNTB in Boston. His work for the Northeastern University Marino Recreation Center, using Autodesk Autocad and 3-D Studio, was featured in *Computer Graphics World* (August 1995). He is currently co-writing a book for New Riders Publishing called "3-D Studio Photorealistic Visualization." . . . Christine N. Govan, MAR '89, reports: "After two years in Japan working with Atelier Zo, I have returned to my native North



IN RECOGNITION of his work in quantum optics, Institute Professor HERMANN A. HAUS, ScD '54, of the Department of Electrical Engineering and Computer Science and the Research Laboratory of Electronics, was honored with the National Medal of Science at a White House ceremony in October 1995. Among other achievements, Haus, with fellow researchers at AT&T Bell Laboratories and Nippon Telegraph and Telephone Research Laboratories, developed the soliton method of transmitting voice and data signals across an ocean without repeating. Whereas normal pulses of light disperse and interfere with each other because they are composed of frequencies that travel at different speeds, solitons are pulses of light that maintain their shape and identity even as they travel very long distances in optical fibers. By eliminating the necessity for "repeating" (the process in which signals are picked up and regenerated every 100 km to avoid deterioration), the soliton method permits higher rates of signal transmission.

Carolina to establish my own architectural firm along with Ken Peterman, a Berkeley graduate who's done work with Christopher Alexander." . . . Samuel Wang, MAR '62, writes: "I am completing my fifth year as chief architect at the Parsons Power Group, Inc., which was listed by *Engineering News Record* as the largest engineering/construction company in the United States. We recently did the engineering design and architectural working drawings (contract documents) for the new co-generation power plant at the Institute."

Alan B. Dolmatch, MAR '68, writes: "I've had a busy year with my real estate consulting firm, Property Condition Advisors, which I founded in 1992 after nine years as a princi-

pal of Aldrich Eastman Walth in Boston. I am still living in Newton with my wife, Nancy. When we scuba dive the world together, Nancy takes along her underwater camera. I occasionally see Ilkka Suvanto, '68." . . . Alan McClennen, SM '47, writes: "As a retired city planner of 79 years of age, it is interesting to have been appointed to the steering committee of the Resource Management Plan for the Pleasant Bay Area of Critical Environmental Concern, a committee with one member from each of the Cape Cod towns of

Brewster, Chatham, Harwich, and Orleans."

Radziah Mohamad, SM '92, MAR '92, reports from El Cerrito, Calif.: "Vincent and I got married in August last year. We were expecting our first child in April. We've been living in Berkeley, Calif., since last August. I am now working for Fong & Chan Architects in San Francisco, while my husband finishes an MBA at Caltech." . . . From Berlin, Hermann Kendel, SM '70, writes: "I gave a lecture at the university in St. Petersburg in September on the Öko-Haus in 'Berlin-Tiergarten,' which Frei Otto and I built between 1980 and 1991."

Noel Jonathan Brady, SM '89, reports: "In 1990, I returned to Ireland to practice at a small firm of architects and teach in the Department of Architecture and Townplanning at the Dublin Institute of Technology. In 1993, I launched my own practice, to provide an integrated design service bridging architecture, land-

scape, product, and urban design. Among completed projects is a feasibility report on an 'Olympic Village for Dublin.' In 1995, I launched a product design-development company, Synthetic Reality. One of the areas that will be researched through this firm is the man-machine interface."

Kenneth E. Wischmeyer, MAR '31, writes: "I retired January 1, 1989, as principal of the Wischmeyer Architects of St. Louis, Mo., after 50 years as principal. I enjoyed my architectural career and give credit to my degree from MIT. I am now 87 and my wife is 86. We had the good fortune to travel all over the world while raising three children, seven grandchildren, and one great-granddaughter."

V CHEMISTRY

Scott M. Rocklage, PhD '82, writes: "I am currently president and CEO of Cambridge-based Cubist Pharmaceuticals, a venture-capital-financed, early-stage R&D company. Our mission is to develop novel technology to treat diseases caused by pathogens that have developed resistance to current antimicrobial agents. Cubist is the third venture-capital-backed company I've been involved with since graduating in 1982. The others were Catalytica, Inc., and Salutar, Inc. My wife, three sons, and I live in Lincoln, Mass. We returned to Boston in 1994 after leaving for California (and Catalytica) in 1982." . . . Chris Orvig, PhD '81, is now a professor of chemistry and pharmaceutical sciences at the University of British Columbia (UBC) and director of the medicinal inorganic chemistry group. He will be chairing and hosting the International Conference on Coordination Chemistry at UBC in August 1996. . . . John H. Fassnacht, PhD '59, writes: "I am working in sales and marketing for Gage Products Co. in Ferndale, Mich., and maintain my office at home. I retired from Du Pont two years ago."

Evan T. Williams, PhD '63, writes: "After serving three years as VP for academic affairs at Lewis & Clark College in Portland, a reorganization eliminated that position. I am now assistant to the president and am also teaching one more chemistry course per year than before."

From Silver Spring, Md., Arnold M. Schwartz, PhD '74, writes: "Please send best wishes to Professors Robert Silbey, Irwin Oppenheim, and Paul Schimmel, PhD '67 (VII)." . . . Jack Throck Watson, PhD '65, writes: "I spent sabbatical leave at Ecole Normale Supérieure in Paris. I am completing the third edition of my book, *Introduction to Mass Spectrometry*, which will be published this year by Lipponcott-Raven Press."

John W. Thoman, Jr., PhD '87, is an associate professor of chemistry at Williams College in Williamstown, Mass. He received a BA in chemistry from Williams in 1982. He is part of a group of faculty and students who have built a lasers and optics group at the college. His research has been funded by the Petroleum Research Fund of the American Chemical Society, the Laser Science Topical Group of the American Physical Society, and a Research Corporation Cottrell Science Grant.

Michael Keck, PhD '93, has joined Emporia State University in Emporia, Kans., as an assistant professor of physical science. He holds a BS in chemistry from the UC/Berkeley. He has conducted research on DNA, RNA, and synthesis. Keck is a member of the American Chemical Society and the American Association for the Advancement of Science.

The Association of Alumni and Alumnae was notified that Francis Clyde Rauch, PhD '65, of Warrington, Pa., the CEO of M&C Specialties Co., died on June 11, 1995, and Genille Cave-Browne-Cave, PhD '51, a professor emeritus of chemistry at McGill University, died on November 10, 1995. No further information was provided.

From Middletown, N.J., **Lynden U. Ribler**, SM '56, writes: "I was elected for a second year as vice-chairman of the New Jersey State College governing board and began my 17th year as a member of the Trenton State College board of trustees. At TSC, the Class of 1995 dedicated their yearbook to me and the alumni/ae association elected me an honorary alumnus. I am also on the board of trustees at the Scholarship Foundation of America." ... A note from **Moise H. Goldstein, Jr.**, SM '51, ScD '57, reads: "I retired from John Hopkins University on June 30 and am now professor emeritus in the electrical engineering department. I am *not* sitting and rocking." ... **Robert A. Iannucci**, PhD '88, has been named director of Digital Equipment Corp.'s Cambridge Research Laboratory. ... From Weston, Mass., **William C. Brown**, SM '41, writes: "I received the 1995 IEEE Microwave Theory and Techniques Society Pioneer Award for 'pioneering work on crossed field amplifiers on platinotrons.'" ... **Arthur L. Fox**, SM '72, of Lexington, Mass., writes: "In 1995, a partner and I launched the second stage of our venture-capital business, Royalty Capital Fund Limited Partnership I (RCFLP). RCFLP employs a unique royalty-based methodology to finance both new and established businesses." ... From Ramstein, Germany, **Klaus Bartels**, SM '75, reports: "I recently completed a tour of duty as communications squadron and base commander at Rhein-Main Air Base in Frankfurt. I am currently assigned to the headquarters of the United States Air Forces in Europe (at Ramstein Air Base, Germany) as chief of command for control, communications, and computer systems programs."

Walter Hamscher, SM '83, PhD '88, writes: "I recently fulfilled a long-standing ambition to return to the Boston area from northern California! I am still director of R&D at the Price Waterhouse Technology Centre in Menlo Park, but now I telecommute, and so far it's working just fine. I haven't figured out yet how to simulate casual in-the-hall, or by-the-coffee-machine interactions with the other staff, so I expect that some periodic trips will always be needed."

Ahmed Tewfik, SM '84, EE '85, ScD '87, was elected a Fellow of the IEEE. ... **Donal K. Holway**, SM '47, writes: "I am still active in hydro-electric (and sometimes steam) work. Although I am no longer affiliated with my previous company, W.R. Holway & Associates, I do contract consulting with them and for other organizations. My recent projects are in the Dominican Republic and eastern Arkansas."

James C. Tsang, '67, SM '68, PhD '73, writes: "I joined IBM Research in Yorktown Heights, N.Y., after leaving MIT in 1973 and have been there ever since. To add some variety to my life, I spent two years as a AAAS-Sloan Foundation Fellow at the White House Office of Science and Technology Policy from 1993 to 1994. This was an eye-opening education in S&T policy making and federal budgeting. Further variety was added this June when I got married. We have joined the two-household set, since Carol is a post-doc-

toral fellow in Japanese history at Harvard." ... **Eberhard F. Wunderlich**, SM '75, PhD '78, of Matawan, N.J., writes: "I am currently a division manager responsible for the development of computer networking services at AT&T Bell Labs." ... **Paul Fuqua**, SM '84, writes: "In my 11-plus years at TI, I've had 10 different supervisors, many different assignments, and the chance to live in San Jose, Calif., for a year and Princeton, N.J., for two months, plus conference trips to Florida, Chicago, and Holland, aside from my usual residence in Dallas."

Janny M.Y. Leung, PhD '86, was promoted to associate professor with tenure in the Department of Management Information Systems at the University of Arizona. From January 1996, she will be visiting the Department of Applied Statistics and Operational Research in the City University of Hong Kong.

Bernard Sheehan, SM '61, has been appointed president and CEO for the new Technical University of British Columbia in Cloverdale. Previously, he was associate VP for computing and communications at the University of British Columbia. From 1967 to 1990, Sheehan served in several senior positions at the University of Calgary, including academic and institutional planning. ... **George Papadopoulos**, SM '64, PhD '70, of Patras, Greece, writes: "Since 1975, I have been a professor in the Department of Computer Engineering and director of the Applied Electronics Laboratory at the University of Patras. My research interests include microprocessor-based design, embedded controllers, ASIC design, internetworking, industrial networks, fieldbus-based control, and computer vision for industrial applications. [My laboratory] has been very active in industrial collaborations and projects sponsored by the European Union."

The Association of Alumni and Alumnae was notified that **John Augustus Roos**, SM '30, of Erie, Penn., died on October 28, 1995, and **George Burnham Hoadley**, SM '32, ScD '37, of Raleigh, N.C., died on September 10, 1995. No further information was provided.

VI-A INTERNSHIP PROGRAM

The deadline for this article is the end of January so you'll read, again, about the Blizzard of '96, which caused such havoc along the Atlantic coast from North Carolina northward to Maine (I hope we haven't had another between now and when you read this). I accumulated more than four feet of snow at my Wellesley home from successive storms about a week apart, one of which was the blizzard. These coastal storms are badly eroding our Massachusetts shores and several famous Cape Cod lighthouses are on the brink of collapse. For example, Nauset Light is only 50 feet from the brink and the parking lot between Chatham Light and the ocean is gone, not far from where many of your MIT classes have held past reunions.

Many of you who had Professor **J. Francis Reintjes** as director will remember the woman who ran his VI-A Office, **Margaret E. (Peggy) Norton**. I am saddened to report that she died December 27, 1995, at age 86. She had been at MIT from 1942 to 1977.

Another death reported in the January 1996 issue of the IEEE's *The Institute* is that of **Bernard M. Oliver**, founder of Hewlett-

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Packard Laboratories. It was he who was instrumental in arranging with **Louis D. Smullin**, SM '39, and me in February 1971 for H-P to join the VI-A Program—the first West Coast company to join the program—welcoming its first students in the summer of 1972 and continuing to the present.

Director **Markus Zahn**, '67, SM '68, EE '69, ScD '70, tells me VI-A has set the schedule for the spring selection process with final selections by companies and students to be completed as this is published. He expects about 150 applications for the 75 openings at more than 33 company locations.

In addition to his VI-A duties, Professor Zahn teaches 6.671, "Continuum Electromechanics," and continues to supervise research with graduate students at the Laboratory for Electromagnetic & Electronic Systems. His interests are in the areas of Kerr electrooptic field and charge mapping measurements in high voltage stressed dielectrics; studies of electrostatic discharges due to liquid flow electrification; development of sensors for charge, moisture and trace additives; and studies of pumping of magnetic fluids in AC magnetic fields.

As faculty advisor to the honorary Eta Kappa Nu, I'm glad to report that the chapter conducted a very successful seminar during IAP '96 on applying for and getting into VI-A. More than 80 students made up the enthusiastic audience. Evaluation forms, returned at the conclusion, showed an increased confidence level of getting into VI-A after attending the seminar.

VI-A's continue to appear in notices on honors and awards that come across my desk:

Made a Phi Beta Kappa Visiting Scholar for 1995-96 is EECS Professor **Shafira Goldwasser**, who is the VI-A faculty advisor to IBM/Yorktown Hts., N.Y.; Intel Foundation has given out sixteen doctoral fellowships of which five were in EECS, one of whom is VI-A grad **Anthony D. Joseph**, '88, SM '88; and another Intel Scholarship for Women in Science & Engineering went to VI-A student **Michelle Y. Eng**.

The Alumni/ae Association received quite a bit of news from VI-A's. **Robert S. Berg**, '50, SM '51, reports: "I am still enjoying visits with 'Hosts for International' students here and with their parents on trips abroad. We feel we receive a great deal from our relationships with these outstanding students and graduates." ... **Ira Gershkoff**, '73, SM '74, writes: "I'm the VP for flight operations systems at Sabre Decision Technologies, a unit of AMR. I'm involved in rejuvenating some of the flight operations legacy systems, an enormously challenging business/technical/political problem. My 15-year-old daughter, Amy, is shopping for an Ivy League college, while my mad-scientist, Nintendo-holic 10-year-old son, Brian, is perfect MIT material. Abject poverty is just a few years away." ... From Indianapolis, **Lauren Christopher**, '81, SM '82, writes: "My husband, Dave Duffield, and I were expecting our first child on February 1. It is the second West McCormick/sixth floor 1981 class baby. **Maria Tricamo Rericich**, '81, SM '83, had her daughter, Josie, last summer. Is this a baby boomlet? Dave and I are

having fun too, at work. We are both on the new digital video projects at RCA. Be ready for lots of digital video products in the future!" . . . **Bernard Steinberg**, '49, SM '49, writes: "I am rounding out 25 years on the electrical engineering faculty at the University of Pennsylvania and will go emeritus June 1996. That means dropping teaching and committees, etc., but not my lab, which will continue research in high-resolution imaging in microwaves (radar) and ultrasound (medical imaging)."

Charles Hieken, '51, SM '52, writes: "My wife, Donna, recently received the Silver Sword of Honor, the highest award conferred by her musical fraternity, Sigma Alpha Iota. She plays the flute professionally with harpist Ruth Salzman. They recently playing at the dinner in the Harvard President's house thanking million-dollar donors to the campaign for Harvard Law School. My daughter, Tina Jane, MD, is an assistant professor in the Department of Surgical Oncology at the University of Illinois/Chicago where she teaches, operates, and conducts research. My son, Seth Paul, is a portfolio manager at the Colony Group in Boston and passed the first two examinations for becoming a certified financial analyst, with one more to be taken in 1996. He received his master of finance degree from Bentley College, where he graduated as valedictorian of the graduate school. I am active as a principal in the intellectual property law firm of Fish & Richardson P.C. The firm is distributing a mousepad reproducing the cover page of the patent I solicited for Bose Corp. naming **Amar G. Bose**, '51, SM '52, ScD '56, and **William R. Short**, '73, SM '75, SCD '80, as inventors covering the acoustic waveguide loudspeaker system used in the Bose Acoustic Wave music system, Wave radio, and Acoustic Wave Cannon loudspeaker system. The Intellectual Property Owners awarded Bose and Short the Inventors of the Year Award for this invention in 1987. I am also on the president's advisory council of Bentley College and on the board of governors of the Downtown Club. **Bill Edgerly** '49 (XIV) nominated me for membership in the club." . . . **George Bevan**, '31, SM '32, writes: "My VI-A Course (Boston Elevated Railroad) guided me in the transportation field. I spent four years with the Chicago Surface Line and another four years with Denver & Rio Grande. I later joined General Electric Co., where I had a very interesting assignment of sales engineering for diesel electric locomotives. I traveled all over North and South America and retired as sales manager in 1973. I am listed in *Who's Who in Railroad* (1968). From 1950 to 1973, I wrote many technical papers and was published in *Railway Age*."

Unfortunately, I was out of the office when **Alan M. Marcum**, '78 (XV), stopped by on November 28 while in Boston for a conference. A note he left reads: "My kids are growing and healthy: Joshua is 5 and Rachel is almost 8 months old."

Time takes its toll, but I still managed to receive Christmas cards from eight VI-A alumni, plus several from past Tau Beta Pi Chapter officers. Those from VI-A included (alphabetically) **Geoffrey J. Bunza**, '74, SM '77, EE '78, PhD '81; **John F. Cooper**, '76, SM '76; **Edward C. Gaiamo**, '74, SM '75; **Cecil H. Green**, '23, SM '24; **Steven K. Ladd**, '81, SM '81; **David L. Lyon**, '69, SM '70, PhD '72; **James E. Mandry**, '81, SM '83; and **Andrew E. Moysenko**, '72, SM '74. Each of these remembrances brings back memories of great associations during my

18-year tenure as VI-A director!

Remember, I do read my e-mail if you're so equipped: <jat@fenchurch.mit.edu>—**John A. Tucker**, director (emeritus) and lecturer, VI-A Program, MIT, 77 Mass. Ave., Rm 38-473, Cambridge, MA 02139-4307

VII BIOLOGY

Anna Cheskis Gelman, MPH '34, writes:

"After I retired from Columbia University School of Public Health in 1981 after 40 years of service, I was immediately reappointed as a special lecturer in epidemiology. I still retain that title which brings my tenure at Columbia to 54 years. My preparation and philosophy was given to me at MIT and is still as contemporary as it was then. I hope that current students are as fortunate in their professors as I was. My husband and I are still functioning, but slightly slowed down." . . . **Richard S. Gordon**, PhD '54, of Tempe, Ariz., reports: "After avoiding travel for years, the U.S. Agency for International Development sent me to Africa last summer to see what could be done to accelerate privatization. By the time this is printed, I will have spent considerable time in Russia trying to reduce the enormous food losses they have experienced post-harvest. This could even include irradiation of some of the more heavily infested/infected food such as eggs, meat, etc."

VIII PHYSICS



David Hall

David Hall, SM '63, of Palos Verdes, Calif., has received the President's Achievement Award from the Aerospace Corp. "for sustained excellence in quantifying contamination and space environment effects using space flight measurements." Hall, a research scientist in the spacecraft phenomena section of

the Mechanics and Materials Technology Center, received the award in ceremonies October 12 at the firm's El Segundo, Calif., headquarters. According to the citation accompanying Hall's award, his contributions to the study and control of spacecraft contamination and the effects of the space environment on materials have influenced the development and evolution of virtually all U.S. Air Force Space and Missile Systems Center satellite programs. His research is credited with significantly extending the useful lives of most DOD satellites. Hall joined Aerospace in 1972 and was named a research scientist in 1980. He holds an undergraduate degree in physics from Antioch College.

Hans Mark, PhD '54, after serving eight years (1984-1992) as chancellor of the University of Texas system, is now a professor of aerospace engineering at the University of Texas/Austin. He teaches courses on orbital mechanics and the history of space flight. . . . From Toronto, **Andrew Cumming**, PhD '89,

writes: "I left academic physics at the University of Florida and am now VP and co-head of equity derivatives trading at Citibank Canada." . . . **George Bernhardt IV**, SM '83, completed a PhD in physics at the University of Maine in December 1994. . . . **John A. Taylor**, PhD '61, writes: "I 'retired' from Boeing in June and started testing software at Microsoft in July. I received a patent at Boeing for an electronic checklist."

Robley D. Evans, a pioneer in studying the effects of radiation on the human body, died of respiratory arrest December 31 in Paradise Valley, Ariz., where he lived in his retirement. He was 88. A professor of physics at MIT for 38 years until he retired in 1972, he was a founder of nuclear medicine and established the standard used throughout the world for the maximum permissible body burden of radium. In 1990, the U.S. Department of Energy presented him with its Enrico Fermi Award for exceptional achievement in the development and use of atomic energy. The citation read: "[he] occupies a special place in the history of radiation physics and biology and the development of our understanding of radiation effects today. He has had a unique impact on radiation biology." Evans was born in University Place, Neb., and earned a BS and PhD in physics at the CalTech. While a graduate student, he began to measure background radiation coming from the earth, so it could be distinguished from cosmic radiation. He gave special attention to the victims of radiation poisoning, which first received national attention in the 1920s, when workers painting the luminous dials of watches made a practice of pointing their brushes with their lips and ingested radium in the process. Once in the body it usually concentrated in the bones, often causing cancer. Research Evans did at MIT enabled him in 1941 to establish one 10-millionth of a gram of radium as the "maximum permissible body burden," or the maximum amount acceptable without the likelihood of bodily damage. Creation of this standard was crucial as the United States embarked on its atomic bomb program during World War II. It is still widely accepted today.

The Association of Alumni and Alumnae was notified that **Bernard Margolis**, PhD '52, of Montreal, Quebec, died on June 27, 1995. No further information was provided.

IX BRAIN AND COGNITIVE SCIENCES

Janet Conway, PhD '81, writes: "I am currently a full-time consultant to the Johnson & Johnson Co. in New Brunswick, N.J., where I develop new pharmaceutical products for vision correction and ophthalmology. My 14-year-old son, Virgil, is designing and building radio-controlled gliders and airplanes. He hopes to pursue a career in aeronautics."

X CHEMICAL ENGINEERING

Peter C. Farrell, SM '67, writes that he is chairman and CEO of ResMed, which started as a management buy-out of sleep technology from Baxter International, where he was a VP. The company manufactures nasal continuous

protective airway pressure devices to treat obstructive sleep apnea (OSA) and other respiratory problems. Untested OSA is a major public health problem and is as common as asthma and diabetes. It is relatively undiagnosed. ResMed manufactures in Sydney and has regional headquarters in San Diego and Oxford. ResMed started in 1989 and had five years of compound growth at approximately 100 percent per annum in both profits and revenues. Its products are sold in 40 countries.

... **Helena Solo-Gabriele**, PhD '95, is now employed as an assistant professor at the University of Miami. ... From Tokyo, **Koichi Kato**, SM '74, writes: "I have been engaged in the technology transfer business (mostly hydrocarbon-related) from Japan to Asian countries." ... From Washington, D.C., **A.L. (Lou) Shrier**, SM '60, reports: "I recently spent a month in Vladivostok advising the territorial government on formulating an energy policy and attracting foreign investment and technology. The Russian Far East has been chronically short of energy, which is retarding economic reform and causing major hardship for the population." ... From Oakland, Calif., **Frederick W. Lam**, PhD '89, writes: "In September 1995, I was appointed to the executive staff as the strategic business planner for the Chevron Research and Technology Co. My responsibilities include preparing the company business plan and coordinating strategic planning. Our second child, Michelle, was born on July 7, 1995. In September, we got together with other MITers and their families (Matthew Croughan, PhD '88 (V), John Aunins, PhD '89 (V), **Anne Aunins**, PhD '91, and **Dave Dudek**, SM '85, ScD '88) for **Al Gasiewski's**, PhD '89 (VI), wedding in St. Louis." ... **Joseph E. Leitgeb**, SM '57, writes: "My wife, Mary, and I continue to enjoy retirement here in Durham, N.C. We have particularly enjoyed visiting the many historical sites in the southeast. Besides travel, I am playing a lot of golf, and have reactivated my hobbies of astronomy and model trains." ... **Michael Snow**, SM '82, PhD '86, currently works as VP and general manager of membrane manufacturing at Desalination Systems in the San Diego area. "Desal" is a \$20 million manufacturer of membranes and spiral-wound elements. Fifteen different membrane chemistries are used for reverse osmosis, nanofiltration, ultrafiltration, microfiltration, gas separation, and pervaporation. These are used for water purification and in chemical and food processing industries for key separations and for waste reduction. ... **David S. Hacker**, SM '50, writes: "As of January 31, I retired from Amoco Research Division. I have initiated a physical properties and hazardous material laboratory at Basic Industrial Research Laboratory at Northwestern University. The laboratory will provide thermophysical property data to chemical, pharmaceutical, and oil companies on a rapid, turnaround basis. New techniques are being developed to rapidly and accurately measure a range of physical properties." ... **Sergio C. Trindade**, SM '70, CHE '71, PhD '73, reports: "I launched the International Environmental Technology Centre in Osaka and Shiga, Japan, for the United Nations Environment Programme in the summer of 1994. I am currently advising the state of Minas Gerais, Brazil, on technology missions to achieve selected social and economic goals." ... **Danielle J. Smith**, SM '75, writes: "I am a senior maintenance engineer at Entergy Oper-

ations' Arkansas Nuclear One in beautiful Russellville, Ark. I am happily married to **Steven L. Smith**, SM '73 (XIII). We have two energetic sons aged 14 and 10. We skied Keystone, Colo., this season and loved it." ... **William C. Kay**, SM '31, reports: "After a career with the Du Pont Co., much of it spent in atomic-energy-related projects for the government, I retired to Pinhurst, N.C., where I still reside with my wife, Eileen. I am looking forward to revisiting Boston and MIT for the first time in 58 years." ... **Andre C. Deprez**, SM '55, '73 (XV-E), has now retired to the shores of Lake Geneva in Switzerland after 40 years of employment in the U.S. chemical industry (Du Pont and Scientific Design). He hopes to continue to do some consulting in technology transfer, as well as skiing and hiking in the Alps.

X-A PRACTICE SCHOOL

After five years as chair of the chemical engineering department at the University of Virginia (UVA) and a one-year sabbatical at the Technical University of Delft, **John O'Connell**, '61, SM '62, has returned to UVA for full-time teaching, research, and writing on the thermodynamics of fluids. He's also leading a program on professional development for all students in the UVA School of Engineering and Applied Science.

Peter Glenshaw, SM '59, an international

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consultant in Washington, D.C., is back from a memorable trip to Bosnia for the World Bank. "My task," he writes, "was to investigate the extensive chemical industry around Tuzla and recommend steps for its reconstruction and development. The industry is based on the important salt deposits of the region. Solution mining of the original deposit is undermining the city, causing buildings to collapse. So a new mine was being developed, which turned out to be on the front lines of the war. Because of sporadic shelling, the mine and the plants downstream of it have not operated for four years. Getting things going again," says Glenshaw, "was not quite the stuff of Course X lectures and quizzes, but I had to dig deeply into the fundamentals we acquired."

For the 58th time since he graduated from MIT, **William C. Rousseau**, SM '36, has distributed an annual letter in which he and his classmates report news and activities. For 1995 Bill admits that his compilation is hardly upbeat—five deaths in the class, and two classmates, **Fred W. Meyer**, SM '36, and **Norris E. Ruckman**, '35, SM '36, suffering from Alzheimer's. The deaths, most of them previously reported in these columns, were

THE PRACTICE SCHOOL received a big boost late last year when **Ralph Landau**, ScD '41, made a major gift to fund a new chair, the **Ralph Landau Professor of Chemical Engineering and Director of the Practice School**. Landau has been a strong advocate of chemical engineering at MIT—and especially of the Practice School—ever since receiving his Course X-A degree; most readers will remember that the building now housing the department is named in his honor. But this is Landau's first major support specifically for the Practice School. After graduating from MIT, Landau worked briefly for the **M.W. Kellogg Co.**, then became a founding principal in **Scientific Design Co.**; when the latter was made part of **Halcon International**, Landau became Halcon's president, chairman, and CEO. Now retired, Landau has pursued his interest in the economics of technological innovation as consulting professor of economics at Stanford.—**JOHN I. MATTILL**



Arthur L. Conn, '34, SM '36; Reid Ewing, '35, SM '36; Benjamin F. Schlimme, '35, SM '36; Charles W. (Smitty) Smith, '35, SM '36; and Walter Ullrich, SM '28, ScD '36. As for the Rousseaus, a "terrible year healthwise," he says, but not to worry. Bill's wife Margaret, ScD '37, broke both arms, one twice, in two falls—but is nearly recovered. And Bill had a recurrence of his prostate cancer in the right illium; though there's no cure there is treatment to slow the disease, which in any event tends to progress slowly. . . . Thonet Dauphine, '35, ScD '39, was named president of his undergraduate class last June and is now planning its 65th reunion for the year 2000. . . . And George H. Cummings, SM '36, describes the trauma of "downsizing" while moving from house to retirement community—"What to do with the class picture from first grade? or snaps from our conquest of Mt. Katahdin?" For the second half of that question there's an answer that may be helpful to many, including MIT: Michael Yeates, curator of MIT collections in the MIT Museum, will welcome any and all MIT-related memorabilia—provided he has the donors' permission to discard duplicates. Write or call before shipping; address: MIT Museum, Building N52, Cambridge, MA 02139; (617) 253-4440.

From Danville, Calif., William K. Fraizer, SM '80, sends an upbeat report: "As environment and safety manager for Chevron Overseas Petroleum, I work with operations around the world. In 1995, I visited our facilities in Kazakhstan, Nigeria, Scotland, England, Australia, and Papua New Guinea. I was also able to take some vacation time in Germany and Australia, where a highlight was snorkeling alongside whale sharks and manta rays at Ningaloo Reef

off the northwest coast." By now, Fraizer said, he would likely be in Angola.

Linda Yeh, '89, SM '91, was in Cambridge late last fall on a recruiting trip for Fluor Daniel, Inc.; she is in process design for the company at Irvine, Calif. . . . Another Cambridge visitor (from Mexico City, where he works with McKinsey and Co.) was Carlos Rojas-Guzman, SM '91, PhD '95, who came by MIT after a one-week training program in New York, which followed a one-month training program in Switzerland in the summer of 1995. . . . Vivek Dodd, SM '92, stopped at the SCEP office while in town for some New England skiing with Friedrich Von Gottberg, SM '92, and his wife, Antonia Banks, SM '92. Dodd is happily employed with J.P. Morgan and Co. in London. . . . From Los Angeles, Nabil Triki, SM '94, reports that he is working on fuel cells for the aerospace division of Allied Signal. "Practice School was the greatest thing I've done," he told Carol Phillips in the SCEP office. "I learned more in Practice School than in all my previous five years in chemical engineering!"

In Altadena, Calif., George T. Keene, SM '52, is an avid astronomer. A minicomputer on his 20-inch telescope, featured in the June 1995 issue of *Sky and Telescope*, located 10,000 objects in the sky when operated at 6,400 feet altitude near his Tehachapi, Calif., cabin. And Keene was able to make good pictures of last October's solar eclipse from the *Marco Polo* off the west coast of Borneo while on a Viet Nam-Malaysia cruise. . . . Michel L. Besson, SM '60, is senior VP of Compagnie de Saint Gobain in France, chairman and CEO of Norton in Worcester Mass., vice-chairman and CEO of Saint Gobain Corp. in Valley Forge, Pa., and vice-chairman and CEO of Certain-teed. . . . Two weddings: Roy Kamimura, SM '92, was married to Maki Kajimura in Osaka, Japan, last July. And classmates Michelle Toyofuku, '92, SM '93, and Peter Ronco, '92, SM '93, were married late last year in Honolulu; both work at Unitek Environmental Consultants, Inc., in Hackensack, N.J.

The death of Henry V. Allen, SM '38, last November in Jackson, Miss., has been reported to us by his close friend Harold A. Ricards, Jr., SM '41, who provided the following details. Allen was 80 at the time of his death from Alzheimer's disease. Before entering the military Allen was a plant manager for the Metal and Thermit Co. in northern New Jersey. As a naval officer in World War II, he served with the Joint Target Group in the Pentagon and later in Japan assessing bomb damage. Thereafter Allen formed and was the first head of the chemical engineering department at Mississippi State University, later becoming head of the Mississippi Bureau of Industrial Development and finally an independent consultant in Jackson, Miss. . . . Fred Henrickson, Jr., '40, SM '41, died on May 13, 1995, in Syracuse, N.Y.; he was 76. Henrickson had retired in 1972 after 32 years of service with Allied Chemical Corp. in Syracuse. He was a member of Sigma Xi, national honorary scientific fraternity, and a charter member and former president of the Syracuse Chapter of the Instrument Society of America. . . . The Alumni/ae Association has been informed of the death last August 20 of Loren L. Dickerson, SM '42, in Huntsville, Ala. He made his career in metallurgy, working for a time with the Reynolds Metals Co., Sheffield, Ala., and later as principal scientific investigator at Redstone Arse-

nal. Further information is expected.

Send news to the undersigned or to Carol Phillips in the SCEP office, MIT Room 66-309, e-mail <carol@pracschool.mit.edu>.—John Mattill, *Technology Review*, Room W59-200, MIT.

XI URBAN STUDIES AND PLANNING

Mihir R. Bhati, MCP '87, writes: "I am a founding member of the South Asian Initiative in Disaster Mitigation, which operates in India, Pakistan, Nepal, Sri Lanka, and Bangladesh. I recently hosted a meeting in Ahmedabad, India, that addressed issues of food, water, and work for disaster victims." . . . Gilberto E. Chona, MCP '91, reports: "On August 24, 1995, Simon Chona was born. He is expected to be a member of the Class of 2012. On the work front, I helped cool off the big scare of the Mexican economic crisis and I was promoted to lead economist for Panama. Thrill and new projects keep coming." . . . Adriana Stadercker MCP '73, PhD '76, reports: "I left Digital Equipment Corp. as executive VP for operations to join a small consulting firm as a managing partner. The Boston Consulting Firm, located in Newton, Mass., provides consulting services to small- and medium-size businesses and nonprofit organizations that are interested in becoming more effective through organizational transformation, business-process reengineering, and executive development." . . . From Chicago, Jacques Sandberg, MCP '95, writes: "I am a senior portfolio manager at the National Equity Fund, a non-profit firm that invests in affordable housing on behalf of Fortune 500 corporations." . . . Joseph D. Sternlieb, MCP '93, is the staff director of the D.C. Council Committee on Economic Development. . . . Gail L. Kendall, MCP '79, writes: "My husband, Richard Friedman, and I adopted a baby boy from Korea. Aaron Sang Min joins 9-year-old Sophie and 4-year-old Harry. I'm the director of finance and administration at the Albany Institute of History and Art and am in charge of planning for renovation and construction of the museum." . . . Eileen F. Babbitt, PhD '93, of Washington, D.C., is the director of education and training at the U.S. Institute of Peace. . . . Patricia R. Brady, SM '88, writes: "I was elected in 1995 as a member of the steering committee of New England Women in Real Estate and am co-chair of their program committee." . . . Jun Sochi, PhD '83, of New York City, was appointed director of regional design programs at the Regional Plan Association (RPA). Sochi will oversee the major components of the "Centers" campaign section of RPA's Third Regional Plan, as well as planning and designing the function of downtowns, communities, streets, and transportation facilities in the tri-state area. Sochi comes to RPA from the capital planning offices of the Metropolitan Transportation Authority, where he served as a capital program coordinator, conducting research and analyses of capital projects. Previously, he has worked as a designer and project manager for both Project for Public Spaces, a nonprofit advocate for better urban design, and the Massachusetts Division of Capital Planning and Operation, which specializes in the construction of state facilities such as universities and hospitals. He holds an MS in urban planning from Columbia University's Graduate School of Architecture, Planning and Preserva-

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The Coming Revolution in Mine Clearance

ALBERT M. BOTTOMS, SM '62 (XV), will chair a conference on "Technology and the Problem of Mine Clearance," Nov. 18-22, 1996, in Monterey, Calif. Bottoms holds the Ellis Johnson Chair of Mine Warfare at the Naval Postgraduate School in Monterey, and he says that the confluence of emerging technologies in autonomous vehicles, sensors, power packs, and navigation and control, taken



Mine clearance, now labor-intensive and dangerous, will be helped by autonomous vehicles and other revolutionary technologies.

together with new tools for surveillance and reconnaissance, is bringing about a revolution in mine clearance.

And not a moment too soon, as the number of civilians and military personnel killed and maimed by mines assumes epidemic proportions worldwide—often continuing for decades after hostilities have ceased in a particular region. Bottoms also notes that

the more well-documented land mines are not the only problem: since 1946, some 550 ships have been sunk by old mines that drifted into shipping lanes.

Mine clearance draws on expertise in a wide range of disciplines—science and engineering fields such as physics, materials science, energy, and artificial intelligence, as well as social sciences like history and cultural anthro-

pology—and the November conference is expected to attract participants from industry, academe, and all branches of the U.S. military. Information is available from Professor Bottoms at the Naval Postgraduate School (Code UW), 586 Dyer Rd., Monterey, CA 93943; (408) 656-3770; fax: (408) 656-3679; <ambottom@nps.navy.mil>. □

tion. Sochi is a member of a U.S. team of planners, architects and economists that has studied urban issues in three Japanese cities.

John Vialet, MCP '64, writes: "I've retired from the federal government and am writing fiction, volunteering at the ACLU, taking yoga classes, watching my garden grow, and generally enjoying life." . . . Thomas J. Nally, MCP '77, MAR '77, reports: "I was appointed by the Brookline, Mass., board of selectmen to co-chair the recently established economic development advisory board. Our role is to promote appropriate development in Brookline that enhances the town's environment and supports existing commercial areas. Amy Schectman, MCP '82, is the town's new economic development officer and works closely with our board." . . . James Richardson, MCP '81, MAR '81, reports: "After four years as director of the community and regional planning program at the University of New Mexico's School of Architecture and Planning, I am on sabbatical as a visiting associate professor of Urban Design and Development at MIT's Department of Urban Studies and Planning. I am also completing a major study with Andy Reamer, MCP '81, PhD '87, on technology transfer and the economic impact of Los Alamos National Laboratory on northern New Mexico. I was awarded a fellowship from the Asian Cultural Council to be a scholar-in-residence at the Chinese University of Hong Kong's Depart-

ment of Architecture in the spring of 1996."

. . . Skidmore, Owings & Merrill appointed Martha Lampkin Welborne, MAR '81, MCP '81, as the managing director of the Los Angeles office. She is responsible for the overall management of the office's business operations in addition to spearheading planning and urban design projects. Her project experience ranges from individual building design to large-scale planning. Besides working with private-sector clients, she has extensive experience with governmental agencies as well as medical and educational institutions. Welborne has served as the national chair of the regional and urban design committee of the American Institute of Architects. In 1993, she was elected into the American Institute of Architects' College of Fellows. In August 1995, Welborne was appointed to the policy board of the American Institute for Architectural Research.

XII EARTH, ATMOSPHERIC AND PLANETARY SCIENCES

Carlton L. Bjerkaas, SM '77, writes: "I recently retired from the Air Force after 25 years. My last assignment was as the director of Technology, Plans, and Programs at Headquarters Air Weather Service. I am now a senior scientist for Science Applications Inter-

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national Corp. in O'Fallon, Ill." . . . From Marcos Island, Fla., Patrick M. Hurley, PhD '40, reports: "I received the Walter H. Bucher Medal of the American Geophysical Union, for my history of early continents."

Isaac Van der Hoven, SM '52, a meteorologist who retired in 1985 from the Air Resources Laboratory of the National Oceanographic and Atmospheric Administration, died July 18, at his home in Potomac. He had Alzheimer's disease. Van der Hoven, a resident of the Washington area for 34 years, began his federal career with the U.S. Weather Bureau in 1964. He had worked at the government's Nevada nuclear test facility on satellite launches and as liaison to the United Nations' International Atomic Energy Agency. He was born in Rotterdam, the Netherlands, and moved to New Jersey as a child. He received a PhD in meteorology from Pennsylvania State University. He served in the Army in Austria during World War II. Van der Hoven attended the Spartan School of Aeronautics in Tulsa, Okla., after the war and taught meteorology there until 1950. He was a member of the American Meteorological Association.

Our condolences to Michael J. Gaffey, PhD '74, who writes: "After 10 years of heavy teaching and research at RPI, my wife, Susan, and I began a one-year sabbatical at Iowa State University in July. Within two weeks of our arrival at Ames, Iowa, Susan began to have stomach pains that became progressively worse. Within three weeks terminal cancer was diagnosed. It progressed very rapidly and Susan died on October 2. I will be staying in Iowa to complete the sabbatical, hoping to finish several of the research projects that she had begun."

XIII OCEAN ENGINEERING

Captain Thomas A. Marnane, NE '64, of Moraga, Calif., reports: "I am still involved in the exciting world of ocean transportation as a VP at Matson Navigation Co. In 1995, we expanded to the Far East with American President Lines adding to an already full engineering and logistics effort." . . . From Laurel, Md., Timothy J. McCoy, SM '93(VI), OCE '93, PhD '95, writes: "I work as an assistant program manager in the U.S. Navy's Advanced Surface Machinery Program. I manage the standard monitoring and control system R&D program that is developing advanced control systems for Navy ships." . . . Richard Salter, SM '80, of Swampscott, Mass., writes: "I am the owner and developer of Senior Health Care Facilities. I race Etchell sailboats in Marblehead, Mass. My children are 12 and 14 years old." . . . From Washington, D.C., Arthur Dennis Long, SM '75, writes: "I work for the U.S. Agency for International Development. In October, I received the 1995 Federal Environmental Engineer of the Year award by the Conference of Federal Environmental Engineers for my efforts to design and implement the U.S. government environmental assistance programs in the former Soviet Union." . . . Larry Donovan, SM

'71, reports: "I am now a VP and manager of operations at Bechtel's high-tech government service company, Bechtel National. My projects cover 16 countries. In 1995, Bechtel National had more than \$800M in work. My wife, Judi, and I reside in Walnut Creek, Calif."

David O. Coelhode Souza, SM '42, writes: "I was the assistant professor of naval construction at MIT from 1942 to 1943; the head of the Department of Repair and Maintenance of Brazilians' Warships at the Rio de Janeiro Navy Yard from 1944 to 1949; the head of the Brazilian Tankers Purchasing Commission in Europe from 1949 to 1953; the technical director of the Frota Nacional de Petroleiros from 1953 to 1954; the director of Engenharia de Marinha Brasileira from 1954 to 1955; and the industrial director of EBRASA Companhia Brasileira de Construção Naval from 1974 to 1994."

Steven L. Smith, SM '73, writes: "I am a senior maintenance engineer with Entergy Operations at Arkansas Nuclear One in beautiful Russellville, Ark. I am married to the lovely Danielle Jarmoluk, SM '73. We have two wonderful sons, 10 and 14. We have recently begun construction on our new home located on the shores of Lake Dardanelle."

Pabitra K. Mukerji, SM '80, writes: "I have been promoted to head of the naval architecture department at McDermott International, Inc., in New Orleans. McDermott is the world's largest offshore contractor. My department oversees the engineering and R&D activities of McDermott's worldwide fleet of offshore vessels/ships. We also per-

form engineering for offshore oil- and gas-platform design and installation and provide technical support to McDermott Shipbuilding, Inc. After seven years of overseas assignment with McDermott in Europe (the United Kingdom, Belgium, and Holland), Australia, and Southeast Asia, I was glad to come home. Now, I have settled here in New Orleans for the last four years. However, I travel overseas three or four times per year. I was in Boston last month on business after a five-year absence. It was great to visit the ocean engineering department again. It brought back a lot of memories."

Richard Ditttrich Schmidtman, SM '41, of Seattle, Wash., died on November 6. After being commissioned ensign in 1932, he rose through the ranks to rear admiral in 1962. He served with distinction in a variety of assignments, both at sea and ashore in a career spanning 37 years. During WW II, he served on a troop transport and commanded two Coast Guard Cutters. His final tour was command of the 13th District, headquartered in Seattle, Wash. Since retirement, he had been active in the Coast Guard Foundation and the Navy League.

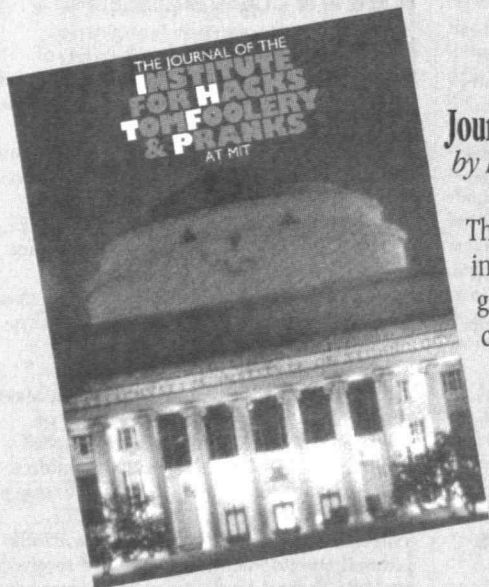
XIV ECONOMICS

Harvard University Press recently published *America Unequal* by Peter Gottschalk and Sheldon Danziger, PhD '76, a professor of social work and public policy at the University of Michigan.

XV MANAGEMENT

Jim Leonard, SM '91, is now living in Rio de Janeiro and working for Sea-Land Service, Inc., as director of development for Brazil and Argentina. He is pursuing projects in port facility and transportation infrastructure development. . . . **Steven E. Shapiro, SM '75**, writes: "I was recently appointed director of strategic planning for Bell Atlantic Video Services, Inc., where I am helping to develop a new generation of interactive television services." . . . **Adrienne E. Weiss Frechter, SM '92**, and her husband, Allen, welcomed twin girls, Serena Allison and Susannah Rose, to their family on November 5. The twins join their 2-year-old brother Daniel. Life is busy in the Frechter household." . . . **Andrew R. Gurbaxani, SM '91**, writes: "Sonia and I love Atlanta! We bought a new home in Roswell, Ga., an historic suburb, and are looking for Sloan alumni/ae in the area. If you're here on business, look us up." . . . **Larry P. Yermack, SM '62**, is currently senior VP and general manager of space systems and intelligent transportation systems for Orbital Sciences Corp. in Germantown, Md. . . . Congratulations to **Cyrus R. Mehta, SM '70, PhD '73**, who writes: "I was elected a Fellow of the American Statistical Association in August 1995." . . . A note from **James H. Morris, Jr., SM '66, PhD '69**, reads: "I am currently the head of the computer science department at Carnegie-Mellon University." . . . **Burt Nanus, SM '59**, writes: "I published three new books

Hack \ˈhak\ *n* 1: A prank, usually elaborate. *v* 1: To perform a prank. 2: To explore the places on campus that are not usually accessible. 3: To work at or study a subject not especially for academic gain.



Journal of the Institute for Hacks, Tomfoolery, & Pranks at MIT by Brian M. Leibowitz

This hilarious book recounts the history, folklore, and ingenuity of MIT students in their quest for the ultimate prank. From the famous Harvard-Yale football game to the Great Dome Pumpkin, this generously illustrated "journal" captures all the spirit and playfulness of the most hilarious tradition in academia. *Paperback, 158 pages, \$19.95*

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in 1995: *Leading the Way to Organizational Renewal* (Productivity Press), *The Vision Retreat: A Facilitator's Guide*, and *The Vision Retreat—A Participant's Work Book* (both by the Jossey Bass Division of MacMillan). . . . **Daniel B. Beardslee**, SM '86, writes: "I am happy to say Sue and I just had our third child, Alex Michael, on December 14. We also have Laura, 4, and Danny, 2. On January 1, I became president of College Park Industries, a venture-capital-funded manufacturer of prosthetic feet." . . . From Huntsville, Ala., **John R. Jordan, Jr.**, SM '92, writes: "At CAS, I was named the technical director of support activities for the Patriot missile system. I am responsible for a staff of 100 engineers, scientists, and support personnel. CAS has been the Patriot's independent integration contractor since 1979." . . . **Harvey D. Jones**, SM '83, has been promoted from executive staff member of the integrated systems division of Computer Sciences Corp. to operations director in July 1995. He was transferred to Dayton, Ohio, and is currently establishing a new office in Morristown, N.J., that will support the development of software for military logistics operations. . . . **Mark S. Rangell**, SM '89, writes: "I am still with Medical Economics. It's been more than three years—a record length of stay with any company since graduate school. As a result of some recent restructuring, I am taking advantage of an opportunity to merge my business, Red Book Database Services, into Micromedex, a Denver-based subsidiary of Medical Economics that produces databases and software used in emergency departments, poison-control centers, and hospital pharmacies in more than 90 countries. After spending several months considering business opportunities, fresh air, quality of life, cost of living, ski conditions, five-mile commute, etc., the decision became pretty obvious. We were building a new home in Highlands Ranch, Colo., and expected to move out sometime around mid-April."

At Inference Corp., **Nobuo Akiha**, SM '82, former director of CBR marketing, was promoted to VP for marketing, responsible for managing marketing for North America as well as coordinating North American with international efforts. Prior to joining the company in 1994, he was a senior consultant at Regis McKenna, Inc., a high-technology marketing consulting firm. Akiha also served as director of marketing communications for Interactive Development Environments (IDE) and was a group product manager at Oracle. Inference Corp. develops and supports client-server software for problem identification and resolution and product-recommendation applications for front office operations, serving the internal help desk, customer support, and sales.

SLOAN FELLOWS

Edgar A. Vaughn, Jr., SM '70, writes: "In November 1995, I was named the outstanding CPA in government by the South Carolina Association of Certified Public Accountants." . . . **David Friedman**, SM '87, reports: "After a few years of sabbatical and serving as CEO/president of Premise, a software CAE company, I have returned to my first love—active technical R&D on signal processing algorithms. Modern software tools make engineering and analysis far more exciting and rewarding." . . . **Carol Holmes Redfield**, SM

'87, writes: "My husband, Chris Redfield, SM '87 (I), and I celebrated the birth of our second child this year. Emily was born on September 19. I returned to work at Decision Focus in December. Chris completes his third year at Silicon Graphics in January."

SENIOR EXECUTIVES

Andre C. Deprez, SM '55 (X), '73, has now retired to the shores of Lake Geneva in Switzerland after 40 years of employment in the U.S. chemical industry (Du Pont and Scientific Design). He hopes to continue to do some consulting in technology transfer as well as skiing and hiking in the Alps.

The Association of Alumni and Alumnae was notified that **William S. Baldwin**, '63, of Cape Coral, Fla., died on October 26, 1995. No further information was provided.

MANAGEMENT OF TECHNOLOGY

John A. Harrison, SM '83, writes: "I am still working for Parsons Brinckerhoff in Boston. I welcome hearing from other classmates who get to Boston." . . . **Hiroshi Shiroy**, SM '92, is with the recently created United Nations office in Osaka. He is a program officer in the International Environmental Technology Center at the United Nations Environment Program. Hiro also narrowly missed the recent earthquake in the Kansai region of Japan. He was traveling on a train that was between Kyoto and Osaka when the earthquake struck. . . .

Taro Hattori, SM '89, has left Taisei Corp. and now works for Ito Yokado, a general merchandise store in Japan. Taro is responsible for purchasing goods from foreign countries and developing private brands in the food group. . . . **Toshiniku Shoyama**, SM '92, is now working in the systems development department of the Mitsubishi Bank. Since the spring of 1995, he has been involved with the bank's computer migration project. . . . **Francis Yeoh**, SM '93, has taken over as the director of the Information Technology Institute, a government-funded research institute. . . .

Hitoshi Arai, SM '95, attended a reception at the MIT Sloan Society of Japan in Akasaka, Tokyo, on January 26, 1996. . . . **Toshiharu Aoki**, SM '94, and Hitoshi joined the Japanese Sloan MBA alumni at this event, which included Dean **Alan White**'s presentation of Sloan's current activities. . . . **Melanie Christensen**, spouse of **Kevin Christensen**, SM '95, stopped by to say hello. Melanie is in Boston to complete the requirements for a master's from Boston University. She reports that Kevin is conducting alumni/ae interviews for the Sloan MBA Admissions Office. Melanie and Kevin are currently living in Arizona, where Kevin is working at Motorola, Inc. . . . **Masahiro Kimura**, SM '95, now works for the silicon division of Showa Denko K.K. in Japan. . . .

Yoshio Noda, SM '94, has received a new assignment at Yazaki Corp. He is now the senior assistant manager of the research and planning department in the EDS Comprehensive Planning Division of Yazaki. He also recently enjoyed a Japanese MOT reunion in Tokyo attended by: **Masahiko Tsuchiya**, SM '93, **Yasuhito Hayashi**, SM '93, **Masatoshi Kano**, SM '93 (MOT, TPP), **Yusuke Harada**, SM '93 (MOT, TPP), **Tetsuo Shimizu**, SM '93, **Hideki Okajima**, SM '94, **Yukio Nakamori**, SM '94, **Masahiro Kimura**, SM '95, **Hirokazu Tsuchiya**, SM '95, **Hitoshi Arai**, SM '95,

CourseNews

Hitoshi Adachi, SM '95, **Yuko Watanabe**, SM '95, and **Hiroki Shinya**, SM '95.—MOT Program, MIT, Room E52-126, Cambridge, MA 02139; e-mail: <mitmot@sloan.mit.edu>

XVI AERONAUTICS AND ASTRONAUTICS

Kent Lietzau, SM '94, writes, "I am involved in flight test at Lockheed Martin. I will fly on the first experimental C-130J aircraft as test coordinator." . . . **Richard E. Harper**, PhD '87, is a senior technical consultant at Stratus Computer, Inc., in Marlboro, Mass., and specializes in the design of fault tolerant computers for business critical applications. . . . From North Bethesda, Md., **Allen G. Ford**, SM '54, writes: "I retired from the Naval Surface Warfare Center, Carderock Division, on October 1, 1995, after 44 years of service with the U.S. Navy as a civilian scientist engineer." . . .

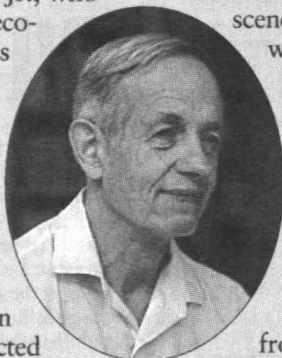
Michael Corvin, SM '88, writes: "I am presently a staff engineer with Lockheed Martin in Denver working on advanced guidance, control, and systems engineering. Efforts include internal and contract R&D as well as support for programs such as RLV (Reusable Launch Vehicle), Titan IV, and EELV (Evolutionary Expendable Launch Vehicle). Skiing and flying are passions. I am very active in our local chapter of the International Aerobatic Club." . . . **Louis V. Divone**, SM '56, writes:

"I was appointed acting deputy assistant secretary for building technologies at the U.S. Department of Energy. I was previously associate deputy assistant secretary for transportation technologies. I am the coeditor of *Energy Series* for the Institute of Electrical Engineers (U.K.). I recently wrote *Wings of History: The Air Museums of Europe*, a history of European aviation development." . . . **Karl Bergey**, SM '51, writes: "All is well on the home front. Our fourth grandchild was due in January. The aviation gene passed through our children without a ripple, but I am glad to report that it has reappeared in our grandson in its most virulent form. There's never any doubt about what to get Matthew for Christmas or any other occasion. Despite firm promises to myself, I agreed to teach the aircraft performance course at University of Oklahoma this fall. The classroom and project activities are great, but the tests, paper grading, etc. are more than I am willing to put up with again. This is my last venture in that arena. Bergey Windpower Corp. is doing very well this year, much better than last year. On average, it has been growing at a rate of about 30 percent annually for the past five years, a refreshing change from the late 1980's. The prospects are still favorable, but the lack of support for alternate energy by the administration and Congress has been a big disappointment. Nearly all of our sales are to overseas customers, primarily for village electrification, telecommunication sites, pipelines, water pumping, and the like. I recently bought a basket-case Curtiss Robin (1929) to rebuild. I am also working on a high-speed, all-metal, four-place touring airplane. Both projects are going very slowly, because of the demands at BWC."

Who Knew John Nash?

NEW YORK TIMES reporter Sylvia Nasar is working on a biography of John Forbes Nash, Jr., who won a Nobel Prize in economics in 1994 and was on the mathematics faculty at MIT from 1951 to 1959. Nash was stricken with schizophrenia in 1959 at age 30, and during nearly three decades of devastating illness, he lived mostly in Princeton, N. J., protected by his family and his friends in the mathematical community. A few years ago, Nash experienced a miraculous remission of his illness and has begun to reap long-delayed recognition of his contributions to mathematics and economics.

Nasar would appreciate hearing personal recollections from people who knew him and seeing correspondence or photographs. Since



the book will also be a social and intellectual history, the author is also interested in the mathematics scene at MIT in the 1950s as well as in some of the other MIT figures with whom Nash interacted, including Professors Levinson, Martin, Wiener, Cohen, Rota, Calderon, Samuelson, and Solow. She would like to hear from people who took a class from Nash (he taught advanced calculus for engineers as well as a course on game theory), attended any of his lectures at the MIT or Harvard colloquia, or was a regular in the math department common room. Nasar can be reached by e-mail <nasar@nytimes.com>, phone (609-734-8153), or letter (Sylvia Nasar, Director's Visitor, Institute for Advanced Study, Fuld Hall #323, Olden Lane, Princeton, New Jersey 08540). □

I hope to get out from under in the next year or two."

The Association of Alumni and Alumnae was notified that **Albert Benjamin Suttle**, SM '55, of Boone, N.C., died on July 31, 1995. He was president of Suttle's True Value Hardware in Boone. No further information was provided.

XVII POLITICAL SCIENCE

Ray Grenier, SM '71, from Nashua, N.H., writes that "Prentice-Hall recently published *Going Virtual*, which he co-wrote with George Metes. He says the book provides guidance and help for organizations in transition that are and reengineering work processes by using the electronic information infrastructure to design and sustain virtual business operations. . . . **Archelaus Rye Turrentine**, SM '74, writes: "Last year, I established an international consulting company that bears my name. I have been very busy working on several cooperative threat-reduction projects in the former Soviet Union. The most important project to date is with Thiokol and Allied Signal involving the design and delivery of three catalytic hydrogenation units to Russia for processing strategic missile propellant into commercial chemicals." . . . Oxford University Press recently published *Mawdudi and The Making of Islamic Revivalism* by **Seyyed Vali Reza Nasr**, PhD '91, an assistant professor of political science at the University of San Diego. In this book,

Nasr examines the life and ideology of Mawlana Mawdudi (1903-1979), who was the first to develop a modern Islamic political ideology and a plan for social action to realize his vision. Nasr has published extensively on Islam and Islamic ideology, most recently *The Vanguard of the Islamic Revolution: The Jama'at-i Islami of Pakistan* (1994).

XVIII MATHEMATICS

Robert H. Scanlan, PhD '43, writes: "A large '80th birthday' symposium was held in October 1994 in my honor. It was attended by over 150 participants from the United States, Europe, and Asia. I had retired in 1985 as head of structures and mechanics from Princeton University, and have been in civil engineering at Johns Hopkins since then. I was elected to the National Academy of Engineering in 1987 and made a Fellow of the American Academy of Mechanics in 1988. I am an honorary member of ASCE and a life member of ASME. . . . **Michaël Kierszenbaum**, SM '90, writes: "We moved last April from Antwerp, Belgium, to São Paulo, Brazil, where I joined Herman Stern e Filho, a major player in the textiles sector (one of the top three in Brazil). As administrative director and CFO, I'm in charge of human resources, finance, treasury, import, and accounts. After two boys (Akiva, 4 years old, and Tavika, 2.5 years old), Ruthy was born on July 6. Mazal tov!" . . . **Niles D. Ritter**, PhD '84, reports: "I am the staff math-

ematician for the cartographic applications group at NASA Jet Propulsion Labs and developer of the GEOTIFF interchange standard for GIS applications." . . . From Falls Church, Va., **Richard M. Soland**, PhD '64, reports: "I recently stepped down as associate dean for academic affairs of George Washington University's School of Engineering and Applied Science to return to teaching and research in the Department of Operations Research. I have been executive director and treasurer of the operations research honor society, Omega Rho, since 1984."

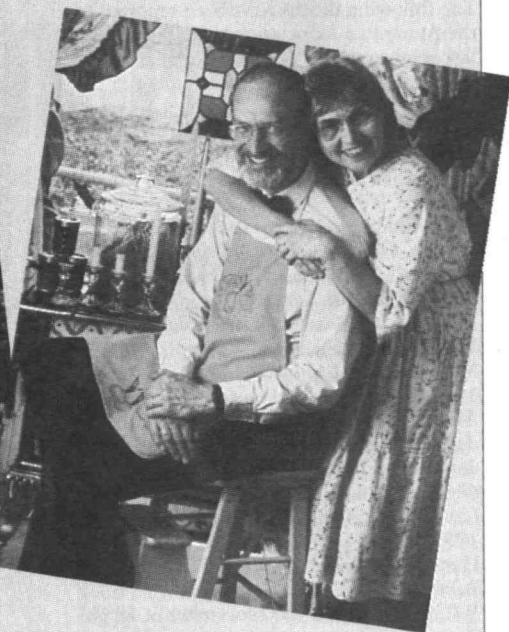
Ruth Britto-Pacumio, a senior at MIT, is the recipient of the sixth Alice T. Schafer Mathematics Prize, which is awarded annually by the Association for Women in Mathematics to an undergraduate woman in recognition of excellence in mathematics. She participated in the Research Experiences for Undergraduates (REU) program at the University of Minnesota-Duluth in 1994.

XX APPLIED BIOLOGICAL SCIENCES

Felix Bronner, PhD '52, writes: "Although I've been retired since 1989 from my position as professor at the University of Connecticut Health Center, I am at my office when in town, writing and editing. Latest book: *"Nutrition and Health—Topics and Controversies"*. I am also an exhibited painter. I currently have paintings in the offices of the speaker of the Connecticut House of Representatives." . . . **Shahla M. Wunderlich**, PhD '78, of Matawan, N.J., writes: "I am currently an associate professor of nutrition at Montclair State University in Upper Montclair, N.J."

XXII NUCLEAR ENGINEERING

Mat Waltrip, SM '89 (II, XXII), writes: "I have left the nuclear industry for a position with Applied Materials in the semiconductor equipment industry. As a program manager, I am helping bring new semiconductor water process equipment products to market. My wife, Ellen, and I just had our first child, Stephen, on October 15, 1995. He is one good-looking baby boy!" . . . **Eric L. Westberg**, SM '72, of Coto de Caza, Calif., writes: "I have returned to Brazil to work on power projects associated with the privatization program and the 2,000 kilometer Bolivia-Brazil natural-gas pipeline project." . . . **Bill R. Corcoran**, PhD '71, reports that he is doing corporate-level nuclear-safety oversight and review work as president of Nuclear Safety Review Concepts Corp. in Windsor, Conn. He serves as a member of safety and management oversight committees for eight nuclear stations. He also assists organizations to learn from adverse experience in the manufacturing and electrical distribution businesses. In 1995, he presented five papers in the general areas of quality improvement and organizational learning. . . . **Mort Goldman**, SM '50 (XI), SM '58 (X), ScD '60, writes: "I have retired as senior VP and technical director of NUS Corp., now a part of Brown & Root, and occupy my time (at least in part) by serving as a volunteer con-



Bobby and Jan Boal, PhD '59, are celebrating their 10th year as innkeepers at the Veranda in Senoia, Ga., a favorite hotel of movie stars. Guests of the Victorian style inn have included Kathy Bates and Jessica Tandy, during the filming of Fried Green Tomatoes, and the cast of The Way. Last fall, Ted Turner Productions rented the entire inn for four months for actors and staff filming Andersonville, a cable-TV miniseries.

sultant to NIH on their environmental issues with neighbors."

XXIV LINGUISTICS AND PHILOSOPHY

The University of Chicago Press recently published *The Semantics of Syntax: A Minimalist Approach to Grammar*, by Denis Bouchard, PhD '82, an assistant professor in the Department of Linguistics at the University of Ottawa.

TPP TECHNOLOGY AND POLICY PROGRAM

Shunichi Kometani, SM '92, informs us that 1995 was a memorable year for him. Although his parents' home near Kobe, Japan, was almost destroyed by the earthquake, his parents are in good health and hope to build a new home with his sister's family. Kometani has two children, Ken, 10, and Eriko, 8. . . . Richard Davies, SM '84 is a financial planning manager at the British Railways Board. . . . Bahman Daryanian, '77 (II), SM '80 (II), SM '86, PhD '89 (II), joined Hagler Bailly Consulting, Inc., as a manager and is currently acting as the lead consultant and the resident advisor for the U.S. Agency for International Development Project on the implementation of a competitive pool/wholesale market for electricity in Russia. . . . Yongun Lee, SM '87, was promoted from manager to deputy general manager at Kia Motors. He has headed a project to establish a

JV auto financing company in Korea. . . . Scott Vance, SM '88 SM (XXII, TPP), now works for E.R. Johnson Associates, Inc., a small consulting firm in Virginia. . . . Erin Craig, SM '89, joined Sun Microsystems in February 1995 as strategic environmental programs manager. She handles customer inquiries on the environmental performance of their systems and keeps the company informed about legislative/purchasing/public trends regarding environmental features or programs. She describes her job as "fantastic!" She has two children: 3-year-old Peter and 6-year-old Kimmy.

Bryan Moser, '87 (VI), SM '89, is a visiting researcher in the Department of Precision Machinery Engineering at the University of Tokyo. . . . With a postdoctoral research award from the National Research Council, Paul Koch, SM '90, is working as a research associate in the Office of Hydrology at the National Weather Service. . . . Jerrard Sheehan, '86 (VI), SM '91, is on staff at the National Research Council. . . . After finishing up at MIT in June 1994, Bhavya Lal, '90 (XXII), SM '90 (XXII), SM '92, joined Abt Associates, a policy consulting firm in Cambridge, Mass. Within one year, she was promoted to senior analyst. She is continuing her work in international economic and environmental policy, and domestic science policy at Abt. Bhavya will be traveling to Europe this winter with her husband Lukas F.S. Ruecker, '88 (II), SM '92 (II, VI), who plans to finish a PhD in computer science at MIT this year.

Michael Sullivan, SM '92 (I, TPP) stopped by the office to say hello. He works at Poloroid Corp. in Waltham, Mass. . . . Jennifer Griffith, SM '93 (I, TPP) is working for the Northeast

Waste Management Officials Associations (NEWMOA), a nonprofit, quasi-governmental organization based in Boston. NEWMOA was established in the 1960s by the governors of the six New England states to deal with air pollution issues. The organization, which now includes New York and New Jersey, has since expanded to include other pollution issues such as solid-waste management. Jennifer's responsibilities include air pollution prevention from industry, mainly developing case studies and policy for the states.

Ed Cheng, SM '94 (II, TPP) is working as a staff engineer at Acurex Environmental Corp. He is currently working on an interesting project with the EPA to assess the technical feasibility and economic impact of emissions control strategies for heavy-duty engines (as part of the EPA's emission standards requirements for 2004). . . . Russell Cohn, '92 (II), SM '94, is working on a telecommunications project in Australia as an associate consultant for Gemini Consulting. He has been spending his free time scuba diving and sailing. . . . Jeff Goldman, SM '94, has just returned from five months traveling in Southeast Asia and is now living in New York, searching for a position in the area of energy/environmental policy. . . . Ulrich Knirsch, SM '95 (I, TPP) has joined the transportation practice of Booz Allen and Hamilton in McLean, Va. . . . Takaaki Takeuchi, SM '95 (VI, TPP) is currently involved in a reengineering project at the Tokyo Electric Power Co. . . . Yoshihiro Ichikawa, SM '68 (I, TPP Friend) is the director general of Tokyo First Construction Bureau.—Richard de Neufville, TPP, MIT Room E40-252, Cambridge, MA 02139; e-mail: <tp@mit.edu>

Deceased

The following deaths have been reported to the Alumni/ae Association since the *Review* last went to press:

Waldo Bishop Clark, '19; November 5, 1995; Marblehead, Mass.
 Mahlon A. Hartley, '21, SM '22; November 15, 1995; Churchville, Va.
 Henry John MacMillan, '24; March 20, 1995; Santa Fe, N.M.
 Israel Goldberg, '25; January 13, 1995; Pelham, N.Y.
 Frank W. Warburton, '25; December 13, 1995; Arlington, Tex.
 Allen Boykin Bassett, '26; February 1, 1996; West Oneonta, N.Y.
 Milton Bernard Morgan, '26; January 18, 1996; Newtown, Pa.
 Alberto Ortenblad, '26; August 29, 1994; Rio de Janeiro, Brazil
 Andrew Anderson, '27; September 9, 1995; New Bedford, Mass.
 Lawrence F. Armstrong, '28; December 8, 1995; Three Rivers, Mich.
 Henry J. Gunning, '28; June 21, 1995; Pebble Beach, Calif.
 William H. Jones, '29; November 6, 1995; Sun City, Ariz.
 Laurence Dexter Luey, '29; August 10, 1995; Charlotte, N.C.
 E. Neal Wells, '29; December 28, 1995; Pinellas Park, Fla.
 Theodore Adam Riehl, '30, SM '31; September 27, 1995; Tucson, Ariz.
 Harold J. Davis, '31; October 24, 1995; Chelmsford, Mass.
 George Moy, '31; September 12, 1995;

Camarillo, Calif.

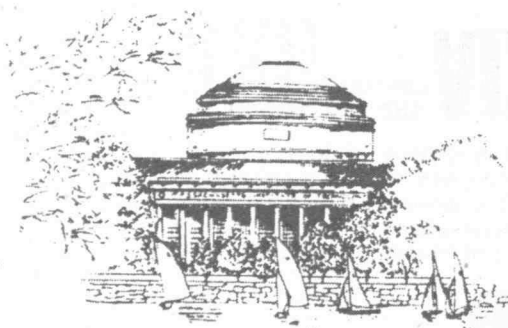
Alfred Augustus Mulliken, '32; September 20, 1995; Fort Myers, Fla.
 Charles Herbert Taylor, '32; November 3, 1995; Watertown, Mass.
 Charles Albert Wesley, '34; September 25, 1995; Wilmington, N.C.
 Blake David Mills, SM '35; December 29, 1995; Seattle, Wash.
 John Pitkin Allen, '36; September 27, 1994; Richmond, Va.
 Dale Pollack, ScD '36; January 25, 1994; Clearwater, Fla.
 Wilbur Manly Skidmore, SM '36; August 23, 1995; Nokomis, Fla.
 Paul Lambert Tillson, '38, SM '39; September 23, 1995; Augusta, Ga.
 William E. Crater, Jr., '40; October 16, 1995; Easton, Pa.
 Jacob A. Samuelson, SM '40; October 23, 1995; Seattle, Wash.
 Arthur Albert Cumberledge, SM '41; January 1, 1996; Coronado, Calif.
 William Augustus McKenney, '41; June 26, 1995; Horse Shoe, N.C.
 Carl Alexander Wickstrom, '41; August 7, 1995; Boxford, MA
 Herbert Morris Johnson, '43; October 31, 1995; S. Lancaster, Ontario, Canada
 Stanley B. Gertz, '44; October 18, 1995; New York, N.Y.
 Robert Anthony Plachta, '44; July 28, 1995; La Jolla, Calif.
 Louis Wright Roberts, '46; November 3, 1995; Wakefield, Mass.
 Mack Elwood Worthen, '46; June 20, 1995; Bellevue, WA
 Anton Frank Zagar, '46; November 21, 1994;

Vancouver, Wash.

George Franklin Breitwieser, '47, SM '47; September 23, 1995; San Diego, Calif.
 George C. Duncan, SM '47; December 15, 1995; Arlington, Va.
 Matthew Charles Ek, Sm '48; September 30, 1995; Chico, Calif.
 Leonard Allen Levenson, '48; January 14, 1996; North Andover, Mass.
 John Harrington, '58; March 20, 1994; Long Beach, Miss.
 Edward Day Dickerman, '52; September 13, 1995; Salt Lake City, Utah
 Oscar Semb, '52; December 31, 1983; Hosle, Norway
 Vernon F. Shogren, MAR '52; December 6, 1995; Banner Elk, N.C.
 H. Stephen Spacil, '52, SM '54; December 8, 1995; Christiansted, Virgin Islands
 Paul L. Meretsky, '53; July 13, 1987
 Elmer J. Korn, '56; May 14, 1994; Mobile, Ala.
 Lew D. French, '58; October 24, 1995; Pearland, Tex.
 Willem Van Dijk, '58; December 13, 1995; Breukelen, Netherlands
 Paul Vernon Osburn, '59, ScD '62; February 19, 1994; Riverside, Calif.
 James Edward MacMonegle, Jr., SM '61; April 22, 1995; Granby, Mass.
 Charles H. Nehf, Jr., '61; November 21, 1995; Kempton, Pa.
 William J. Kosinar, '66; January 1, 1996; Cambridge, Mass.
 Merrill Lawrence Duxtader, SM '71; December 8, 1995; Fairport, N.Y.
 David Edmund Hodges, '71; December 18, 1995; Santa Rosa, Calif.



HERE MIGHT
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PuzzleCorner

Readers who enjoy combinatorial and other math problems having a chess theme (like Problem 1 in this issue) may be interested to know that Mario Velucci, in collaboration with Alessandro Castelli, is working on a new edition of *Math-Chess Bibliography* and seeks references of all kinds on related material. You can reach him at Via Emilia 106, I-56121 Pisa Italy or <velucchi@cli.di.unipi.it>.

Problems

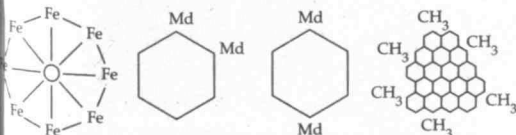
M/J 1. Mario Velucci wants you to place N queens on an N by N chess board so that the maximum number of vacant squares are Unattacked. For $N=1$, there are no vacant squares, and, for $N=2$ and $N=3$, all vacant squares are attacked. But, for $N=4$, you can leave 1 vacant square un-attacked and, for $N=5$, you can leave 3. How about $N=10$ and $N=20$ or possibly even $N=30$?

M/J 2. Just before mailing this problem to me in March 93, Eugene Sard purchased a bunch of 29-cent and 23-cent postage stamps and was surprised to note that the total was a (non-zero) whole number of dollars. What is the smallest number of stamps that Sard could have been purchasing?

M/J 3. Nob Yoshigahara wants you to factor 123456789 into two five digit numbers.

Speed Department

Winslow Hartford wants you to name the following "chemicals."



SEND PROBLEMS, SOLUTIONS, AND COMMENTS TO: ALLAN GOTTLIEB
NEW YORK UNIVERSITY
715 BROADWAY, 10TH FLOOR
NEW YORK, N.Y. 10012,
OR TO: GOTTLIEB@NYU.EDU

Solutions

1995 A/S 2. This problem as corrected in January reads:

ACROSS

1. A multiple of this number is obtained by removing the first digit and placing it after the last digit.
7. The year in the 20th century when Easter is earliest.
11. Divisible by 7, 11, and 13.
12. Multiple of 30 Down.
13. When added to 16 Across is equal to the sum of 23 Down and 25 Down.
14. See 26 Across.
15. A multiple of 9.
16. See 13 Across.
17. This number has the same first and last digits.
18. A multiple of 3.
19. Ten times 31 Across plus five times 13 Across.
21. Factorial 9.
24. Multiple of 28 Across.
26. Sum of 3 Down and 14 Across.
27. See 8 Down.
28. See 24 Across.
29. See 4 Down.
31. See 19 Across.
32. Equal to 22 Down.
33. $10^5 \times \pi$ to the nearest integer.

DOWN

1. The cube of a prime number.
2. A multiple of 17 Across.
3. A multiple of 7.
4. Sum of twice 21 Across and 29 Across.
5. See 10 Down.
6. This number is equal to the sum of the cubes of its digits.
7. A cube number.
8. The sum of 15 Across and 27 Across.
9. See 20 Down.
10. A multiple of 5 Down.
19. A square number.
20. Ten times 9 Down plus 1.
22. Equal to 32 Across.
23. See 13 Across.
25. See 13 Across.
30. Factor of 12 Across.

The following solution is from John Goodman. Reasoning (A and D mean Across and Down; n is used for any unknown digit; p through z for specific ones):

1. The following are immediately calculable: $7A=1913$; $21A=362880$; $33A=314159$.
2. Since 10D starts with a 3, 5D must start with a 1 to be a factor.
3. 1A could thus end in 12 (its rotated multiple being 24); 13 (39); 14 (42); 16 (64); or 19 (95). 12, 16, and 19 can be eliminated due to definition 6D (no three-digit numbers beginning with 2, 6, or 9 are the sum of the cubes of their digits). 13 can also be eliminated because 1A would have to start with a 9 and multiplying by 3 ($13 \times 3 = 39$) would add a digit. Hence 1A ends in 14 and starts with a 2. Back calculating gives $285714 \times 3 = 857142$.
4. 6D must be therefore be 407.
5. 1D, a cube of a prime, is now $2nnn3nn$. Testing shows that only 137 cubed ($=2571353$) has the two required digits.
6. 11A must be a multiple of $(7 \times 11 \times 13)$ so $5nnn = 5005$.
7. 17A is now 1n1, and $3D = 50n1$ must be multiple of 7, and thus 5061.
8. $2D = 80n$ must be multiple of 17A, 1n1. Only two possibilities: $808 = 8 \times 101$, or $805 = 5 \times 161$, making 14A 786 or 756 making 26A 5847 or 5817.
9. $22D = 32A$ making them 68n8.
10. By definition 4D, $725760 + 3nnnn = 75nn87$ so $29a = 3nn27$ and $30d = 28$.
11. $10D = (3 \times 5d)$ so 12A starts with 1, 2, or 3. Only multiples of 28 with center zero digit are 308, 504, and 700 hence 308.
12. 7D, $18nnnnn4$, is a cube and must be 264 cubed = 18399744.
13. 15A, qr7, is a multiple of 9. Digit q must be at least 5 because of definition 4D ($75qn87 + 725760 = 3nn27$). Also, since $10D (39n5nn19) = 3 \times 5D (13rn8n73)$, r must be less than 4. The only two possibilities are 837 and 927. But since $8D = 15A + 27A$, $9sn = (837 \text{ or } 927) + nn7$. 15A must be 837 and $27A = 1n7$ and 8D must end in 4.
14. We have $5D \times 3 = 10D$ or $133n8n73 \times 3 = 39n5nn19$; only solution is $5D = 13318173$ and $10D = 39954519$.
15. From definition 13A, $st9 + 7nu9 = 2nvw + xyz5$ so $w = 3$ and $32A = 22D = 6838$.
16. By 4D again, $758n87 = 725760 + 33v27$ so $4D = 758887$, $v = 1$, $29A = 33127$, and $18A = 81$.
17. By definition 19A, $n91n5 = 4pz10 + (st9 \times 5)$, so 19A must begin with a 4 since $(13A \times 5)$ can be at most 4995.
18. 19D, $40nn1$, is a square number and must be 201 squared = 40401, making $27A = 147$ and $8D$, $9s4$, equal to $837 + 147 = 984$.
19. Now 19A, $491n5$, $= 4pz10 + (5 \times 8t9)$. Regardless of t, product is $4nn5$ so $p = 5$.
20. $20D$, $1tu51$, $= (10 \times 1tun) + 1$, so 9D ends in 5 making 19A = 49155.

Continued on Page MIT 41

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
2	8	5	7	1	4	1	9	1	3
11.	5	0	0	5	13.	0	8	13.	0
14.	7	8	6	15.	8	3	7	16.	4
17.	1	0	1	18.	8	1	19.	4	9
21.	3	22.	23.	2	8	8	0	24.	9
26.	5	8	4	7	27.	1	4	7	1
29.	3	3	1	30.	2	7	0	31.	4
32.	6	8	3	8	33.	3	1	4	1

MIT LIFE INCOME FUNDS

MR. AND MRS. JAMES A. LEVITAN

HOME: Stamford, Connecticut

CAREER: Although Jim Levitan entered MIT with the Class of 1945, his Navy service delayed his graduation until February 1948. He took a job in chemical engineering, his major field, but he soon felt that his future lay elsewhere and so entered Columbia Law School that fall. He joined a Wall Street law firm in 1951 and, with the problem-solving skills he developed at MIT, gravitated toward tax law. In 1965, he became "the tax department" of the New York law firm Skadden, Arps, Slate, Meagher & Flom. By 1995, when Jim officially became Of Counsel, the firm had grown from 15 lawyers to over 1,000, with offices around the world.

Jim and his wife Ruth, who met when they were law students, have three daughters and seven

grandchildren. They are avid gardeners, and their garden has been featured in *The New York Times*, *Architectural Digest* and *House Beautiful*. Jim has served MIT on the Educational Council, department visiting committees, the MIT Corporation, and as an officer of the Class of 1945. In 1988, he established the Levitan Prize in the Humanities for innovative scholarship by School of Humanities and Social Science faculty.

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For more information about MIT Life Income Funds, write or call D. Hugh Darden, W. Kevin Larkin or Frank H. McGrory at MIT, Room 4-234, 77 Massachusetts Avenue, Cambridge, Massachusetts 02139-4307; (617) 253-3827.

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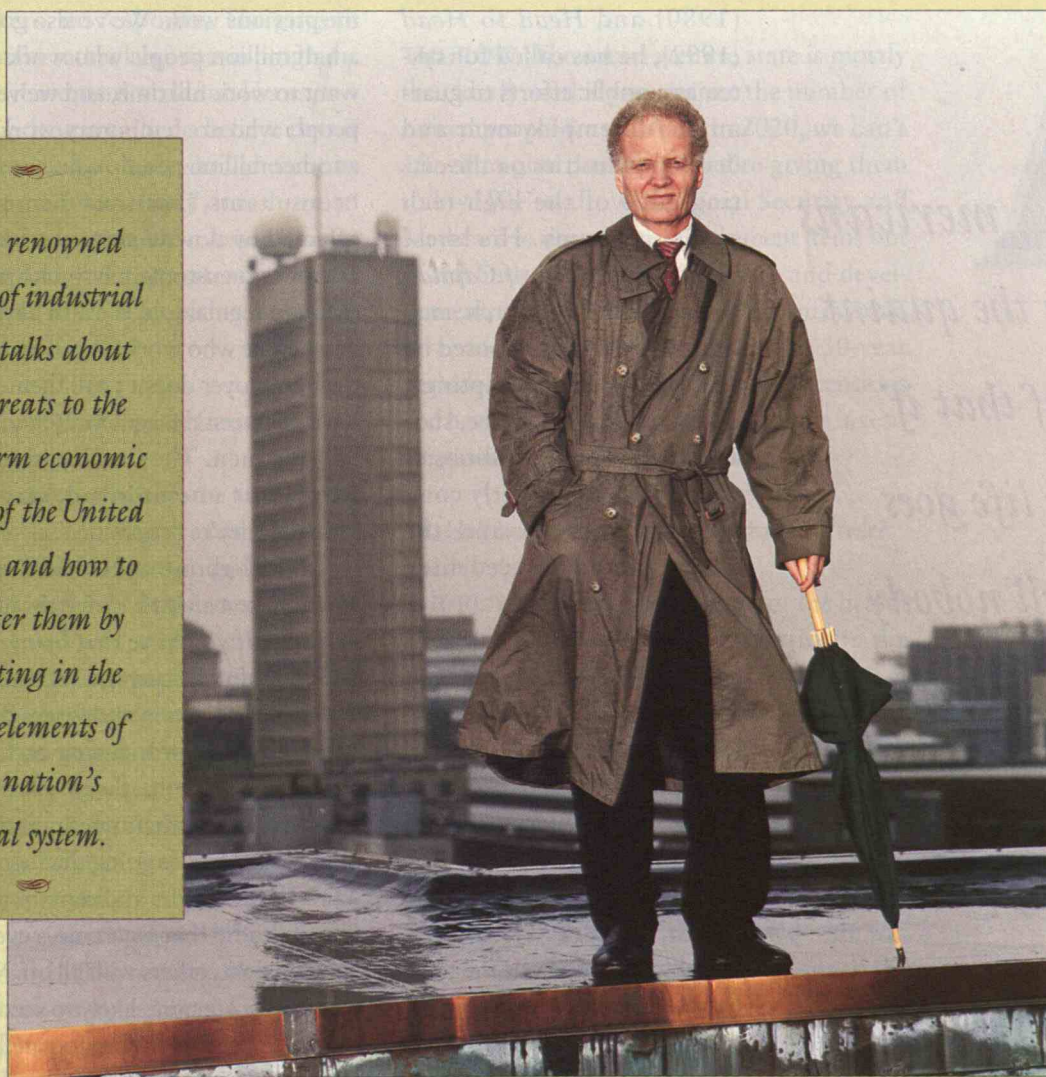


DONORS' PROFILE

Building a Better Economy

AN INTERVIEW WITH LESTER THUROW

The renowned maven of industrial policy talks about the threats to the long-term economic health of the United States, and how to counter them by investing in the basic elements of the nation's social system.



With “downsizing” the subject of major media inquiries, including a recent cover story in *Newsweek* and a seven-part series of mega-articles in the *New York Times*, economic security is again on everyone’s lips. Jobs everywhere seem to be in jeopardy. As economist Lester Thurow points out, reports of continual layoffs only underscore the antiquated nature of our present system. Capitalism, he says, arose when a timely ideology—a stress on maximizing individual welfare—fortuitously merged with the new technology of the steam engine, which could drive an industrial system. Yet today technologies such as computing that rely on human brain power rather

A*mericans
have the quaint
belief that if
your life goes
to hell nobody
should come to
your rescue,
and if somebody
does it means
you are a lesser
human being.*

than rich natural resources require an ideology that fosters collaboration on crucial social investments such as education and R&D.

Thurrow has never been shy about cutting to the heart of economic issues, whether in revealing the fundamental causes of problems or in prescribing strong medicine for solving them. In magazine columns, in television interviews, and in bestsellers such as *The Zero-Sum Society*

(1980) and *Head to Head* (1992), he has called for systematic public efforts to guarantee full employment and develop industries on the cutting edge of the high-tech global economy. His latest book, *The Future of Capitalism*, published in March, analyzes the challenges posed by "tectonic forces" sculpting a new economic landscape, such as the infusion of millions of workers from formerly communist countries and the advent of an unprecedented elderly population.

Formerly dean of MIT's Sloan School of Management and vice-president of the American Economics Association, Thurrow is presently Lemelson professor of management and economics in the Sloan School. In an interview with managing editor Sandra Hackman, Thurrow talked about the need for the United States to reject self-defeating moves toward "survival-of-the-fittest" capitalism and embrace a thoughtful mixture of public commitment and private initiative essential to creating an economy that works.

TR: Every week we hear of another company laying off thousands of people, yet the unemployment rate is not at its historical high. How can this be?

THUROW: The United States nominally has one of the lowest rates of unemployment in the industrialized world because we don't count a lot of people as unemployed. About 7 and a half million people are officially out of work, but we have another 5 or 6 million people who say they want to work but who don't meet any of the technical criteria for being unemployed, such as that they visited a potential employer in the previous week. We've also got about 4 and a half million people who work part time but want to work full time, and we've got 8 million people who are temporary workers. We have another million people who are self-employed "consultants," many of them professionals affected by downsizing who may even have one or two customers but who would be glad to take a regular job. We also have about 2 million people who work on call and don't work if their employer doesn't call them. And then we have, between the ages of 20 and 60, 6 million missing men. They're not in school, not at work, not unemployed, not in jail, not retired—they're dropouts.

Overall about a third of the labor force would like to work more than they're now working. If you have that many unemployed, you shouldn't be surprised if the law of supply and demand kicks in and wages drop. Unfortunately, instead of focusing on how to create more and better jobs, the people in Washington are spending all their energy trying to cut the social safety net, arguing that somehow everyone will hold tight and remain in the system. But we know that isn't true—even if some do hang on tight, others will fall off. We also know that people are more likely to succumb to disaster if we take away the safety net, just as when people climb mountains without a rope they are more likely to fall. The fear ratio goes up, and as the fear ratio goes up, coordination goes down.

TR: Do you foresee serious political and social upheavals resulting from significant unemployment and falling wages?

THUROW: Not necessarily. If you reduce wages three-quarters of one percent a year, everybody effectively thinks, "Hey, I'm to

blame.” It has to do with American ideology. You see this most clearly if you compare this country with France. When the French government recently proposed making what were, by American standards, very small cuts in the social welfare state, the French took to the streets. If you look at the United States, in contrast, Reagan fires all the air traffic controllers and there’s no response. AT&T gets rid of 48,000 workers, no response. The guys in Washington make rather large cuts in programs such as Medicaid and student loans, no response. Americans really do believe that if your life goes to hell nobody should come to your rescue, and if somebody does come to your rescue it means you are a lesser human being. We tend to give the system no credit when we do well, so we don’t blame the system when we do badly.

TR: Where does this belief come from?

THUROW: It stems partly from the fact that the United States is the only country with founding fathers who we think of as demigods. Europe evolved out of a system of feudalism that everybody understood was wrong and had to change. The interesting thing is how little the U.S. political system has changed in 200 years. For example, everyone knows that American high schools are the worst in the developed world, but we don’t do anything about them because Thomas Jefferson invented local school boards and they’re deeply embedded in what we think of as a perfect system. Unfortunately, local school boards have conflicts of interest—how do you flunk your neighbors’ kids and get elected?—and in any case are uniquely unqualified to run school systems. In general, school boards have no knowledge of what kids are going to need 20 years from now and no interest in the long-run success of the nation. The result is that few Americans could pass the French baccalaureate or the Japanese or German equivalent. Americans who go to college catch up with their European and Japanese counterparts, but those who don’t fall permanently behind.

To address this and other long-term prob-

lems at the heart of our economic crisis, we need to realize that people’s success or failure is due not only to their own initiative but also to how well the social system works. Success is certainly not a function of the “market” alone.

TR: But in your opinion does the United States have to cut back on the social welfare state if we are to create more well-paying jobs?

THUROW: The social welfare state is mostly the elderly, and if you project the number of retired people we will have in 2020, we can’t afford to give them what we’re giving them today. We’re allowing Social Security and Medicare to drive all the investment items out of the budget. So we cut research and development, we cut education, we cut infrastructure, and pretty soon—over a 20- or 30-year period—we have a budget that is all pensions and health care and nothing is left for the investment items that every society needs.

TR: Isn’t health care a major economic driver?

THUROW: If you do something for the health care of 20-year-olds you’re investing in the economy, because if you can keep them healthy, they will in fact have long working lifetimes. If you do something for the health care of 70-year-olds, you’re not investing in the economy—a 70-year-old’s health is pure consumption.

TR: That sounds pretty hard-hearted—are you proposing to relegate older Americans to the poverty levels common before Social Security and Medicare?

THUROW: The issue is not poverty. The average elderly person in America has a per capita income substantially above that of the average person under the age of 65. And of course a lot of people are now retiring earlier. We’re subsidizing this income heavily—retired individuals get back all the money they paid into the Social Security system plus interest in less than 4 years. After that they’re essentially on welfare. That means we’re basically taxing





poorer people to give money to richer people.

We should set up a system under which no Social Security recipient gets less than the poverty line but nobody gets more than the median income. If individuals want to do better than that they have to rely on personal savings and private pensions. Unfortunately, politicians don't want to face up to this problem because there are so many elderly voters. The issue is particularly difficult because it is a new one for humanity: the first society in history dominated by elderly voters will occur around the year 2025. But sooner or later we will have to devise an alternative approach because society has to have resources to invest in R&D, infrastructure, and education.

TR: What about cutting the military budget—the other major piece of the pie—to finance pensions and a range of social needs?

THUROW: The military is already down to about 4 percent of GDP. Since Vietnam we've paid for a lot of the expansion of support for the elderly by cutting military expenditures. If you cut those expenditures by another quarter you get a little breathing room but don't solve the fundamental problem.

TR: Why are long-term investments so important in maintaining a successful economy?

THUROW: Take what everybody says is the most exciting economic phenomenon at the moment—the Internet. Where did the Internet come from? It was paid for by the Department of Defense and the National Science Foundation 30 years before it became economically viable. Government basically kept that technology going until it could attract private investment. The same thing happened in biotechnology—the government invested for 30 years before private companies got to the point where they could make profitable biotech products. If we don't make similar investments today, we won't have new industries coming along later that can provide jobs, income, and productivity.

Unfortunately, the budgets Clinton and Gingrich have been fighting over are going to cut

investment items proportionately much harder than consumption items and will make our problems worse, not better.

TR: How do we know that if we make those investments they won't pay off more for China, say, than the United States?

THUROW: The problem is you don't. But China is not really competing with Route 128 and other areas that develop high technology. To have a successful economy you've got to have world-class infrastructure, you've got to have world-class skills, and you've got to do world-class R&D, and China simply isn't rich enough to do all those things. So there's room for everyone.

There are some industries—textiles is one of them—where low-wage countries have a tremendous advantage, but there are lots of other industries where low wages don't provide an advantage. The automobile industry is a good example, because in the best automobile plants these days we assemble a car with about 11 hours of labor. If you're building a \$30,000 machine with 11 hours of labor, it doesn't make much difference whether you pay the workers \$40 an hour or \$4 an hour. And you don't do it with labor-intensive methods because you can't build a high-quality car with thousands of people swarming over it.

TR: How do we decide which projects to invest in, as well as which ones government should pursue and which ones should be left to private industry?

THUROW: With R&D there's kind of a natural division of authority. If a project should pay off within 6 years, then that's something private industry can and will finance. If you're talking about something that's not going to pay off in terms of a marketable product within 10 years, it is clearly something government should finance. For between 6 and 10 years there needs to be a mixture. In Europe the government says: if you come through the door with a good medium-term project and half the money, I'll provide the other half. So what they're doing is

lengthening time horizons and cutting risks, but the firm has to put up some money.

TR: The Clinton administration hasn't fared very well in its efforts to secure funding for joint public-private R&D projects.

THUROW: They talked about doing that in the beginning and then it all got buried under health care. I think the administration made a big mistake: its three possibilities for major initiatives included a big infrastructure project, reskilling and upgrading the education of those Americans who graduate from high school but don't go to college, and health care. The administration chose health care. But that was a poor choice. Reforming health care was never something that was going to happen within two years—it would more likely take eight years. Americans don't like paying for health care, but they're also reluctant to change an existing system. Plus health care is a consumption item.

I think the choice should have been infrastructure because it is an investment item, and because projects such as building bridges are visible and can be accomplished within a reasonable period of time. Also, the great thing about infrastructure is that we know how to do it.

TR: What kinds of projects should we fund?

THUROW: One area clearly is high-speed rail transportation between major cities within 200 miles of each other. We could also speed up the process of wiring the country with fiber optics. And we could improve our roads and bridges, which we have basically let rust. Those efforts not only stimulate the economy but they provide a lot of jobs, and they're generally well-paying jobs.

But the most important "infrastructure" investment is education. No private company would ever pay for producing a college graduate. Sixteen years of money in before you get any money out? It doesn't meet capitalist criteria. Yet producing college-educated adults is terribly important in terms of maintaining a successful economy. And no society in the world has ever become literate without being willing to invest

substantial funds in public schools.

Basically we have to understand that we live in a very different world than we did in the 1950s and '60s—it's now a world that depends much more on knowledge industries than on natural resources, which you either inherit or you don't inherit (and nobody inherited more than we Americans). And those industries, just like the people who work in them, have to be incubated over a long period of time.

TR: Even if we educate Americans better and boost funding for R&D and infrastructure, will enough well-paying jobs result?

THUROW: They will if we allow the economy to expand. The Federal Reserve Board is using high interest rates to hold economic growth to 2.5 percent. To generate good jobs for most people, you have to be willing to forgo the war on inflation that's already been won and let interest rates drop further. You also need a global economy that's growing faster, which means putting pressure on other countries to let their interest rates fall and their economies expand.

TR: Do we also have to use trade negotiations to open up other countries to what we are selling?

THUROW: The problem is not other economies—it's Japan. At some point the United States and the world have to solve the Japanese problem, which is that nobody has been successful at selling products in Japan. The Japanese have been running a \$140 billion trade surplus with the world, about half of that with the United States.

Unfortunately, President Clinton hasn't been willing to threaten the Japanese so they will take seriously his demands that they buy more U.S. goods. What we've been doing thus far doesn't work. Talking doesn't work. Negotiating

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system works.

doesn't work. Yelling and screaming doesn't work.

We have to give up the idea of intervening directly in the Japanese economy while also finding a way to correct today's serious



infrastructural and social investments you gradually see a stagnant economy. If you remember your high-school history, teachers used to talk about all these wealthy societies that fell apart because people quit investing in their irrigation canals.

The Moors had very elaborate irrigation systems in southern Spain, and the Incas had comparable systems in Peru. When the Spanish conquered those two societies they didn't make the social investment in the canals, and half a century later those once-rich places were very poor.

TR: Are we capable of learning such lessons?

THUROW: That depends. When something very dramatic happens—for example, the 1929 stock market crash—societies usually reorganize themselves to prevent it from happening again. What people find much harder to deal with is a very slow decline—say, of one-half of one percent per year—that we look back on 25 years later and say, “Hey, that was a big deal.”

TR: How can we snap out of our lethargy?

THUROW: We have to follow Chairman Mao's dictum that a journey of a thousand miles starts with the first step, and the first step is to choose some highly visible project that evokes national pride the way the moon project did—for example, a world-class high-speed rail line between San Diego and San Francisco or between Boston and New York. Such projects would not only provide a more efficient transportation system and local jobs but excite people about American technological prowess, underscore the government's commitment to serving its citizens, and awaken us to the possibilities for building a better economic future. ■

trade imbalance. Rather than trying to force the Japanese to open up specific sectors such as automobiles and rice, we ought to insist simply that they buy roughly as many goods from us as they sell to us. If, for example, the Japanese buy \$100 billion worth of our products in any given year, we should allow them to sell \$110 billion worth of products to us the following year. That way the ball is in their court—they can decide what they want to import, or even *whether* they want to import.

TR: What do you think of Patrick Buchanan's suggestion that we impose high tariffs on Japanese goods?

THUROW: I'd rather give the Japanese an incentive to expand their imports than prevent them from continuing to export to our economy.

TR: In any case, shouldn't our first concern be to get our own house in order?

THUROW: Yes. At the moment we're selling the idea of survival-of-the-fittest capitalism while forgetting about the community itself. If you don't make the basic

We live
*in a world that
depends on know-
ledge industries
as opposed to
natural resources,
and those indus-
tries have to be
incubated over
a long period
of time.*

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<http://web.mit.edu/techreview/>

TECHNOLOGY UPDATE

900 MHz breakthrough!

New technology launches wireless speaker revolution...

Recoton develops breakthrough technology which transmits stereo sound through walls, ceilings and floors up to 150 feet.

by Charles Anton

If you had to name just one new product "the most innovative of the year," what would you choose? Well, at the recent *International Consumer Electronics Show*, critics gave Recoton's new wireless stereo speaker system the *Design and Engineering Award* for being the "most innovative and outstanding new product."

Recoton was able to introduce this whole new generation of powerful wireless speakers due to the advent of 900 MHz technology. This newly approved breakthrough enables Recoton's wireless speakers to rival the sound of expensive wired speakers.

Recently approved technology. In June of 1989, the *Federal Communications Commission* allocated a band of radio frequencies stretching from 902 to 928 MHz for wireless, in-home product applications. Recoton, one

of the world's leading wireless speaker manufacturers, took advantage of the FCC ruling by creating and introducing a new speaker system that utilizes the recently approved frequency band to transmit clearer, stronger stereo signals throughout your home.

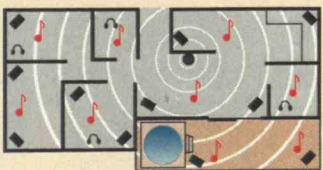
**Crystal-clear sound anywhere.**

Just imagine listening to your stereo, TV, VCR or CD player in any room of your home—without running miles of speaker wire. Plus, you'll never have to worry about range because the new 900 MHz technology allows stereo signals to travel distances of up to 150 feet through walls, ceilings and floors without losing sound quality.

150 foot range through walls!

Recoton gives you the freedom to listen to music wherever you want. Your music is no longer limited to the room your stereo is in. With the wireless headphones you can listen to your TV, stereo or CD player while you move freely between rooms, exercise or do other activities. And unlike infrared headphones, you don't have to be in a line-of-sight with the transmitter, giving you a full 150 foot range.

The headphones and speakers have their own built-in receiver, so no wires are needed between you and your stereo. One transmitter operates an unlimited number of speakers and headphones.



Recoton's transmitter sends music through walls to wireless speakers over a 70,000 square foot area.

A single transmitter, unlimited receivers.

The powerful transmitter plugs into an audio-out, tape-out or headphone jack on your stereo or TV component, transmitting wirelessly to speakers or headphones. The speakers plug into an outlet. One transmitter broadcasts to an unlimited number of stereo speakers and headphones. And since each speaker contains its own built-in receiver/amplifier, there are no wires running from the stereo to the speakers.

Full dynamic range.

The speaker, mounted in a bookshelf-sized acoustically constructed cabinet, provides a two-way bass reflex design for individual bass boost control. Full dynamic range is achieved by the use of a 2" tweeter and 4" woofer. Plus, automatic digital lock-in tuning guarantees optimum reception and eliminates drift. The new



Breakthrough wireless speaker design blankets your home with music.

technology provides static-free sound in virtually any environment. The speakers are also self-amplified; they can't be blown out no matter what your stereo's wattage.

Stereo or hi-fi, you decide. These speakers have the option of either stereo or hi-fi sound. Use two speakers (one set on right channel and the other on left) for full stereo separation. Or, if you just want to add an extra speaker to a room, set it on mono and listen to both channels on one speaker. Mono combines both left and right channels for hi-fi sound. This option lets you put a pair of speakers in the den and get full stereo separation or put one speaker in the kitchen for hi-fi sound.

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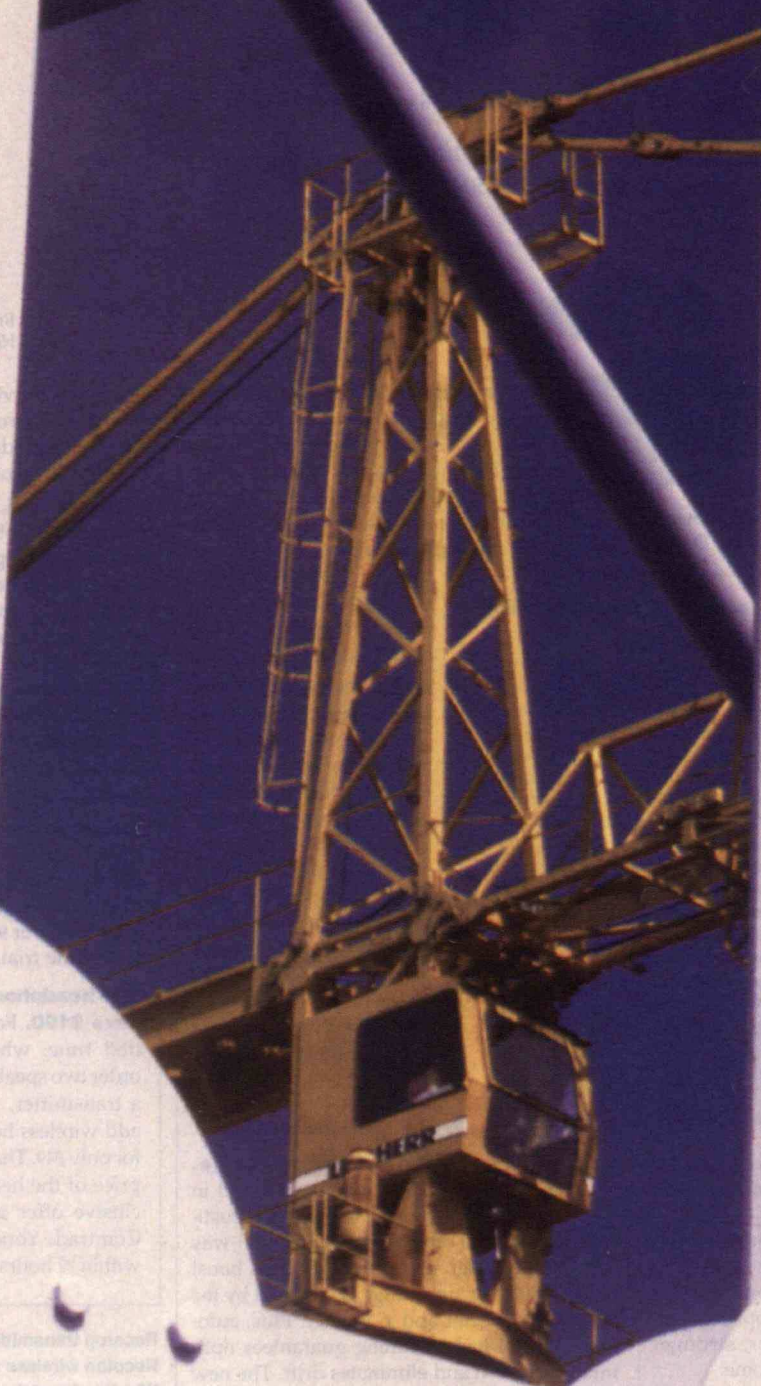
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BY CLARK WIEMAN

DOWNSIZING INFRASTRUCTURE

As cities stagger under the cost of building and maintaining public works, investment in concrete and steel must give way to more efficient alternatives.

The United States has made a multitrillion-dollar investment in infrastructure, from waterworks to streets and highways to electrical networks. Systems in many urban areas are reaching the end of their useful lives, trapping local governments in a seemingly unwinnable game of triage: as federal and state support dwindles, officials must decide which systems to salvage. And infrastructure funding will become even tighter as local and state governments are asked to shoulder a growing portion of the costs of programs addressing AIDS, housing, childcare, and other pressing social problems.

Clearly it is in local government's best interest to pursue least-cost solutions to problems posed by aging public works. Part of the answer entails a major shift in the way government approaches infrastructure planning. Today, most agencies overseeing public works think in narrow terms of capital construction or reconstruction. But in many cases, there are alternatives. Well-

thought-out environmental regulation, land-use planning, and demand management can delay or completely offset concrete-and-steel solutions, saving billions. In most cases, the new approaches boil down to two sometimes distinct, sometimes overlapping concepts: reducing demand and improving long-term planning.

Cutting Consumption

Bringing demand for infrastructure under control presents cities with a huge challenge. Total vehicular travel has grown fivefold in the past four decades, per capita solid-waste generation has doubled, and water consumption has outpaced population growth in many metropolitan areas. Today a typical four-person household drives 28,000 miles, generates 5,800 pounds of municipal waste, and consumes an estimated 115,000 gallons of water in one year.

A major culprit is infrastructure policies that shield consumers from the true costs of the services they receive. Consider the effects of direct government subsidies. To varying degrees, each type of system—roadways, waterworks, sewage plants, and power plants—receives public funding from local or federal sources. Such financial support, while certainly necessary, distorts the systems' actual cost. For example, the Tri-State Transportation Campaign, a consortium of transportation analysts in the New York City region, estimates that automotive taxes and tolls cover just 65 percent of the cost of using the city's roads and bridges—including the cost of maintenance and providing traffic patrols. Under this estimate, taxpayers subsidize New York City motorists by \$2.4 billion annually. Similarly, a U.S. Department of Transportation study found that user fees and earmarked taxes covered just 69 percent of nationwide highway expenditures in 1985.

Other subsidies are indirect. U.S. motorists fail to cover an estimated \$400 billion in "external" costs—the price of pollution, noise, congestion-related delays, and excess wear on infrastructure—according to a 1994 study by Kohnheim and Kecham, a leading New York City engineering firm. Failure to cover these costs with automobile surcharges, gasoline taxes, or tolls in effect pushes up the demand for infrastructure, adding to the wear and motivating bureaucracies to expand capacity.

Today these consumption patterns are colliding with the financial obstacles to building new systems and replacing old ones. The hurdles are compounded by worries over jammed highways, overflowing landfills, and unhealthy urban air, not to mention widespread concern that communities drowning in a sea of cars—and asphalt—are becoming less and less attractive places to live and work.

But there is immense potential for improving the effi-

ciency with which we travel, consume material, and use water. In this regard, the enormous gains made in the efficiency of electric power consumption—which have caused a leveling of demand—serve as an inspiration.

From Mega to "Nega"

Energy guru Amory Lovins first outlined in 1976 how superefficient technologies—from light bulbs to electric motors to industrial chillers—can lead us down a "soft" energy path that dramatically cuts electrical use while maintaining living standards. Though at first it met with strong criticism from the electrical industry, Lovins's vision is today widely accepted. Some 20 utilities now aggressively push efficiency, while as many as half have moderate conservation programs, according to David Moskowitz, director of the Regulatory Assistance Project in Gardiner, Maine, an educational resource for public utility commissions.

Central to this vision is the idea that people don't demand electricity—they demand the services electricity provides: light, ice cubes, preserved food. As equipment becomes more efficient, service levels and standard of living can be maintained on far fewer kilowatts, providing the opportunity to eliminate the most expensive, dangerous, and polluting power plants.

The same logic can be applied to transportation, water use, and garbage generation. After all, people don't demand highways or wastewater treatment plants or landfills—they demand transportation, potable water, and efficient removal of waste. Just as the electrical industry has shown that small investments in efficiency can offset huge investments in power generation, so can communities meet the demand for other services without spending billions on new public works.

How do we change the current incentives that boost U.S. consumption and the need for supporting infrastructure? Lovins's concept of the "negawatt" may offer some answers even outside the realm of power generation. In essence, negawatts are a measure of electricity "supply" derived from efficiency. They cost only one-tenth to one-fifth as much as electricity from a new power plant. As Lovins puts it, "One can think of a 14 watt replacement for a 75 watt lamp as a 61 negawatt power plant."



CLARK WIEMAN is research director of the Infrastructure Institute at Cooper Union in New York City. He recently concluded "Underbelly of the Beast," a series of public lectures and tours of the city's infrastructure.

By the early 1990s, utilities in at least eight states were actively investing in negawatts—with as many as three-quarters of all utilities expressing interest before a recent wave of deregulation and restructuring destabilized the market. Southern California Edison is a prime example. Between 1981 and 1994, the utility cut electricity demand by an average of almost 500 megawatts per year, for a combined saving equivalent to the output of at least three nuclear power plants. Utilities that take such steps realize a profit, since expenses—in terms of both capital investment and operating costs—fall faster than revenues.

Perhaps similar marketlike mechanisms could motivate public-works agencies to stem consumption of their services and, in the longer term, to cut their investment in infrastructure. It is conceivable that public agencies could be recast as public-private utilities

and waste-reduction methods. Indeed, the new nega-units could, like negawatts, become a commodity that can be traded between utilities, even between customers.

The theoretical basis for negagallons, negamiles, and negajunk is the same as for negawatts. Namely, demand for water, automobile travel, and materials is elastic: it can change quickly as incentives change. Experience with drought in Northern California, for example, has shown that water demand can be cut by more than 50 percent for homes, 60 percent for parks, and 20 percent for businesses. During the 1977 drought, in fact, several Northern California municipalities slashed their consumption by nearly 60 percent.

Japan and most Western European countries, moreover, generate only about half as much waste per capita as the United States. Heavily taxed “tipping fees” at landfills are \$200 to \$300 per ton in Japan, where land is at a premium and indigenous resources are scarce.



The costs of subsidizing automobile travel in the United States include not only vast expenditures on road and highway construction but also the high price imposed by congestion, pollution, noise, and other urban problems.

comparable to electric utilities. Properly devised, these enterprises could profit from marketing the logical follow-on to negawatts—negamiles, negagallons, and negajunk.

While these utilities would not be dispensing a commodity like gas or electricity, they would have authority over travel, municipal or commercial waste, or water consumption—and the supporting infrastructure—within a given territory. Of course, that authority would not extend to rationing or controlling flows; rather, the utilities would quantify usage and implement strategies to moderate consumption, with the financial payback distributed to customers within the region. Similar to today's agencies, they would have authority to issue bonds to build and maintain infrastructure, with debt service supported by user fees or taxes. But as with Lovins's negawatt scenario, they would have the incentive to cut consumption levels through investment in water-saving technologies, transit and telecommuting,

This pricing, 10 times the U.S. level, more accurately reflects the true costs of using the land and stimulates innovation in recycling methods.

Despite the allure of the private automobile, driving can be moderated as well. On São Paulo's aggressively promoted “Alert Days”—a demonstration program to relieve air pollution—automotive travel fell 90 percent. And per capita auto use in much of Western Europe is 20 to 55 percent below the U.S. level. Granted, the much greater size of the United States requires more transportation infrastructure. But Canada, similar both culturally and geographically, drives 10 percent less than the United States and has less than half the roadway mileage per capita, according to John Pucher, associate professor of urban planning at Rutgers University.

Taking advantage of this elasticity in demand, redesigned bureaucracies could become seedbeds for innovations in efficiency, which could be marketed around the world. (Lovins estimates that the global



The conventional approach to dealing with waste—building more landfills and incinerators—is giving way in some cities to “noncapital” solutions, such as aggressive recycling and waste prevention programs.

market for electrical efficiency is \$1 trillion; the nega market for waste, water, and travel may be larger.) It is not difficult to imagine transportation utilities with a staff of telecommuting experts providing technical assistance to firms looking to cut auto travel. Water departments could design and install water-saving retrofits like gray-water systems (which use recycled water for toilets and irrigation). They could also profit from encouraging customers to install more efficient fixtures; a 1994 New York City study showed that providing a \$240 rebate for converting to low-flow showerheads and toilets would cost only one-third of the \$8–12 billion price tag for developing new water sources.

The market-based nega concept could provide a palatable alternative to government intervention in everything from auto congestion to interstate garbage flows. The San Francisco Bay Forum, a consortium of business leaders, academics, and government officials, advocates using market incentives to cut auto travel and spread demand throughout the day as a means to counter impending regulatory measures. The forum’s “Market-Based Solutions to the Transportation Crisis” recommends a system of emission fees, highway user fees weighted to reflect congestion levels, and the replacement of free parking with employee travel allowances. Users would still have free choice, but price signals would push them to choose the most economical and socially beneficial mode and time of travel. The monies generated could fund an expanded range of choices, including more transit and more high-occupancy vehicle lanes.

Planning Ahead

Properly designed and regulated, the infrastructure utilities would work with local public agencies to pursue mutual planning goals. Long-term planning, the other main route besides demand management to cutting infrastructure spending, is often overtaken by daily

crises, especially in mature cities with aging public facilities. But some municipalities are undergoing what Eileen Kaufman, chief planner for the New York City Department of Environmental Protection (DEP), calls a “paradigm shift” in planning—a move away from capital construction and toward innovative and cost-effective solutions.

In 1990, for example, the DEP established a program to protect upstate watershed areas that provide the city with 1.5 billion gallons of water daily. The logic is simple: the cleaner the water at the source, the lower the cost of rendering it fit to drink. Designed to meet the U.S. Environmental Protection Agency’s mandated water-quality levels for New York City, the program became politically charged—pitting environmental activists against an upstate business community emboldened by a new Republican governor. Still, a management plan was recently accepted by the EPA. A combination of development controls, preservation of strategic buffer zones near reservoirs, and upgrading of upstate treatment plants, costing some \$1 billion, is now in place to offset an estimated \$6–8 billion investment in water filtration infrastructure downstream, according to environmental attorney Robert F. Kennedy, Jr., whose organization, Hudson Riverkeeper, was formed to protect deteriorating New York City water quality.

Another New York City effort, the award-winning Bluebelt Project, is moving beyond conventional methods of managing water runoff from streets—methods that amount to “putting everything in a pipe.” Thirty-year-old plans for developing 5,000 acres of wild land on Staten Island are being revamped to reduce wastewater infrastructure and preserve wetlands. New schemes call for diverting storm water to acreage that would remain undeveloped—in essence, an urban wetland. By using existing streambeds instead of building huge sewer mains, the program will save \$50 million in sewer construction as well as offset the need to expand wastewater treat-

ment. At the same time, the scheme will preserve natural drainage patterns for flood control, provide community open space, and protect wildlife habitat.

In Minneapolis, vigorous waste-management planning has eliminated the once-pressing need to expand landfill capacity, according to James Craig, senior engineer of Hennepin County's Environmental Management Agency. A campaign launched in the early 1980s developed a multifaceted approach to handling the waste of the area's nearly 1 million residents. First, it put in place one of the nation's most aggressive recycling programs; recycling rates have soared from about 25 percent in the late 1980s to 48 percent today. Next the campaign upgraded a waste-to-energy plant and developed a refuse-derived fuel (RDF) plant that turns some of the municipal waste into a coal substitute burned by the local electric utility. Now the focus is on waste prevention, a concept that can include exchanges of reusable materials between companies, the more sparing use of paper within offices, and procurement procedures that eliminate surplus materials.

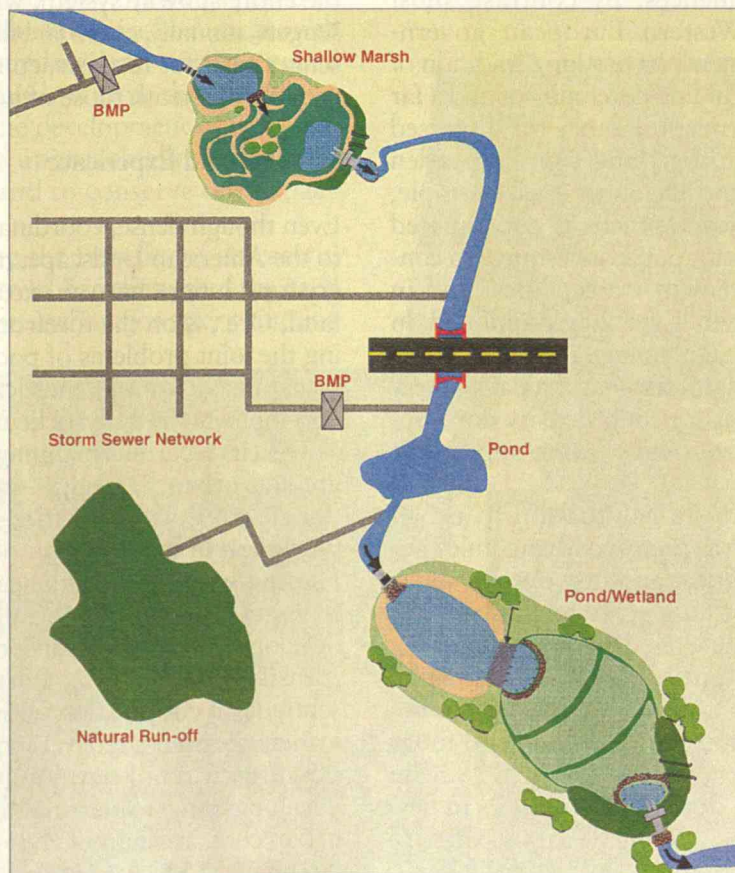
Similarly, in Seattle, projections in the early 1980s of dwindling landfill space spurred waste management policies based on "noncapital programs," according to Jeffrey Gaithsford, manager of the city's recycling program. Since 1986, recycling rates have grown from 18 to 50 percent, circumventing the need for new incinerators.

To reduce the demand for automotive travel, the key policy approach is urban planning that makes more efficient use of land. A group known as 1000 Friends of Oregon, a nationally recognized planning-advocacy organization based in Portland, points to the "3 Ds" of appropriate land-use planning. The first is density—the ratio of residences to acreage. Experience in San Francisco has shown that people in compact neighborhoods make 42 percent fewer auto trips than their suburban counterparts. A doubling of density cuts vehicle miles traveled by 30 percent. Besides being advantageous for transportation, denser development offsets other infrastructure costs as well. A 1989 study by the Urban Land Institute, a research and

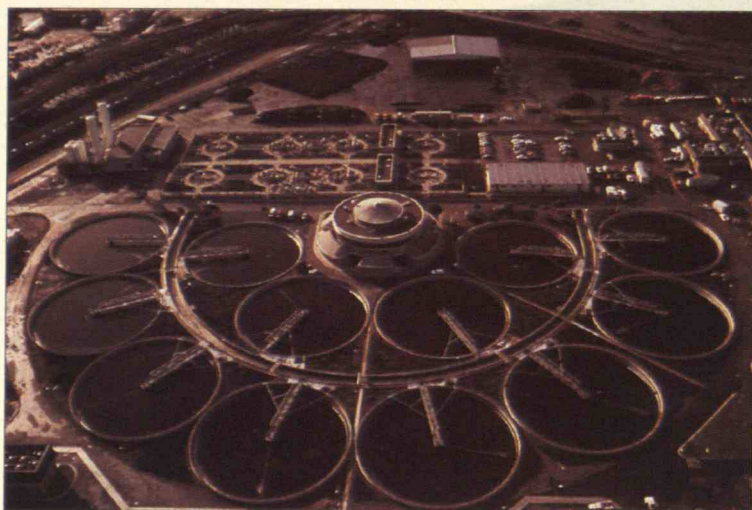
education group in Washington, D.C., showed that infrastructure costs per dwelling unit drop precipitously as density increases. The combined costs of utilities, schools, and streets fall from \$90,000 for one dwelling sited on four acres to just over \$10,000 per unit for developments that place 30 residences on an acre.

The second D is designation—the extent to which residential, commercial, and industrial uses are mixed or isolated—which determines the distance between trip origins and destinations. As zoning became legally mandated early in the century, it was used to separate hazardous smokestack industries from residential and commercial centers. This history is still reflected in most modern zoning codes, which designate homogeneous, isolated uses of land, greatly increasing trip distance. In many cities, such zoning makes driving virtually essential and greatly inhibits pedestrian and bicycle travel. By contrast, mixed-use developments, which place offices, shops, residences, and other types of buildings side by side, can cut automobile travel. Many planners argue that mixed use also creates a more active and interesting social setting and promotes a greater sense of community and neighborhood.

The final D is functional design, which is required to expand transportation options and make communities more livable. Even in dense mixed-use areas, drainage ditches, large parking lots, and busy streets lacking crosswalks can be obstacles to pedestrian, bicycle, and public-transit travel. Pedestrians find cul-de-



The Staten Island Bluebelt Project promises to save \$50 million in storm-sewer construction by preserving natural streambeds instead of replacing them with large sewer lines. Before entering streams, wastewater passes through "best management practice" (BMP) basins, which slow it down to reduce erosion and allow contaminants to settle.



Building new water purification plants puts a strain on public works budgets. Alternatives include installing low-flow toilets and shower-heads, introducing "gray-water" systems that recycle water for toilets and sprinklers, and protecting watershed areas so less purification is needed.

many cases dispersed growth is virtually prohibited. In Canada, too, strong regional planning gives high priority to dense, coordinated land use—and local governments provide tax bonuses for high-density development and strictly limit downtown parking to promote public transit.

The United States, with its habituation to urban sprawl, averages 2.5 times as many roadway miles per capita as European countries, and just over twice as many as Canada. And transit use in Western Europe is 3 to 8 times higher than in the United States.

Coordinated dense land use can cut governments' share of operational costs for transit. Contrary to the common belief that European countries spend more public funds on transit, the fact is that in 1982 the United States led Western developed countries in per-passenger transit subsidies, paying 86 cents per trip. Other countries' subsidies ranged from 73 cents in Swe-

sac and streets with no sidewalks especially vexing.

To put these infrastructure-saving concepts into practice, however, communities will have to reexamine their attitudes toward another big D, development. Pucher of Rutgers argues that development in the United States is largely haphazard, fixated on the return on private investment and blind to social consequences. By contrast, most Western European governments have a long tradition of guiding development and a far lower tolerance for dispersed private land use. In Sweden and Denmark, for example, development is coordinated with public investment in convenient transit lines, and in

den to just 13 cents per trip in Switzerland. Simply put, compact development makes transit more attractive, and commuters are willing to pay more for it.

Any development pattern that promotes transit over automotive travel is a prime way of cutting infrastructure costs. Transit not only offsets the automobile's indirect costs—pollution and congestion—but is substantially cheaper in direct capital costs. For example, the Oregon Department of Transportation estimates that a certain six-lane highway into Portland, carrying 3,000 peak-hour passengers, would cost \$3.24 billion, including the necessary expansion of approach roads. A light-rail line for the same corridor would cost just \$1.5 billion, while carrying 1,000 more rush-hour passengers, accord-

ing to G.B. Arrington, director of strategic planning for Tri-Met, the regional transit agency. And ridership could be expanded to 6,000 much faster and more cheaply than highway capacity could.

Transit investment today can also help city planners cut long-term transportation costs, circumventing the problems that now face aging cities like New York. The city must contend with a multibillion-dollar deficit in rebuilding a massive network of auto infrastructure dating from roughly 1930 to 1960. For example, an estimated \$1 billion is needed for just a three-mile stretch of elevated highway, Brooklyn's Gowanus Expressway. While the costs aren't exactly comparable, upgrading the entire subway system, which services a billion passengers annually, cost \$16 billion over 10 years. Per-passenger costs for reconstructing transit are thought to be roughly one-tenth those of highways.

The Portland Experience

Even though dense, coordinated land use is pretty alien to the American landscape, municipalities that are hungry for solutions have an excellent model to follow. Portland, Ore., is on the forefront of U.S. cities in addressing the joint problems of poor air quality, auto congestion, unsightly and inefficient sprawling suburban development, and skyrocketing infrastructure costs.

The city's current planning efforts are rooted in progressive urban strategies—not unlike the multifaceted policies of European cities—launched more than 20 years ago in anticipation of a surge of growth. Dispensing with plans in the early 1970s to build a new freeway, Gov. Tom McCall spearheaded a move to develop new regional transportation strategies stressing transit. And in 1972, Portland Mayor Neil Goldschmidt, in cooperation with community and business leaders, devised a redevelopment plan that encouraged downtown retail development, boosted downtown development densities, created a residential zone in the urban core, and curtailed downtown parking.

Today, MAX, a 15-mile light-rail line, is among the

nation's most successful new transit systems, with more than 60 miles of suburban extensions under development or in planning. Tom McCall Waterfront Park, 40 acres of open green space on the banks of the Willamette River, has replaced six lanes of asphalt. Similarly, Pioneer Square, a bustling downtown open space that anchors Portland's civic and retail center, sits on the former site of a parking garage. And pedestrian-friendly design, including tree-lined transit malls, has become a cornerstone of downtown redevelopment.

Portland has also taken major steps to discourage driving downtown. While most zoning codes require a minimum amount of parking per square foot of development, Portland takes the opposite approach, placing a ceiling on parking spaces. The Downtown Parking and Circulation Policy allows just 7 spaces per 10,000 square feet of development near transit lines and 10 spaces per 10,000 square feet elsewhere. The policy also bans the demolition of buildings to create surface parking lots. Not coincidentally, the city's once-serious air-quality violations are a thing of the past.

All major project designs are geared toward pedestrians and transit riders. Pioneer Place, a \$180 million downtown complex, is most easily reached by three surrounding transit lines. An \$85 million convention center in the eastside Lloyd District is fronted by a light-rail station and a pedestrian plaza. And a new 19,200-seat stadium for the Portland Trailblazers, being developed in coordination with MAX, will include just 3,400 off-street parking spaces.

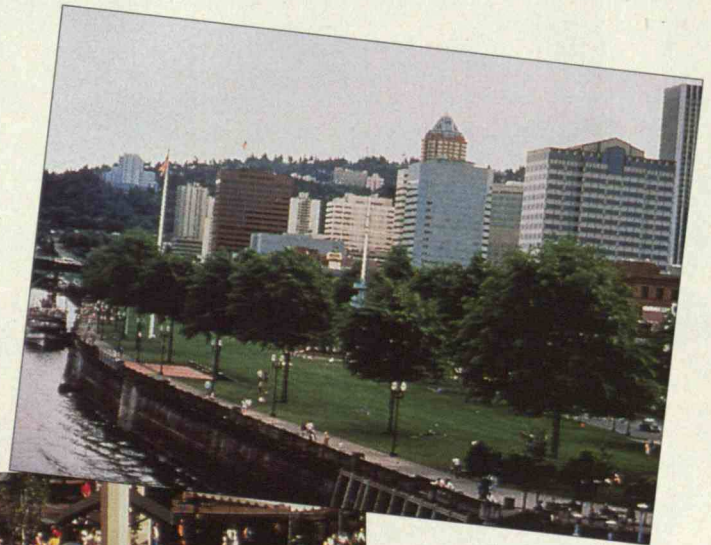
But perhaps the most innovative move has been to discourage sprawl by establishing an "urban growth boundary." Beyond the boundary, land is strictly zoned as either forest or farmland; within the boundary, building laws encourage the development of compact, livable communities. This approach allows Portland both to grow efficiently and to conserve open space surrounding the city.

Portland is now reaping the benefits of its careful planning. Curtailed auto travel has eliminated the need to add two highway lanes to each major artery entering Portland and to build three downtown parking garages 30 stories high, according to Keith Bartholomew, staff attorney for 1000 Friends of Oregon. By making the downtown more inviting, the integrated policies also helped create 30,000 new inner-city jobs, without appreciable increases in vehicles, trips or parking spaces. Planners credit the efforts with attracting

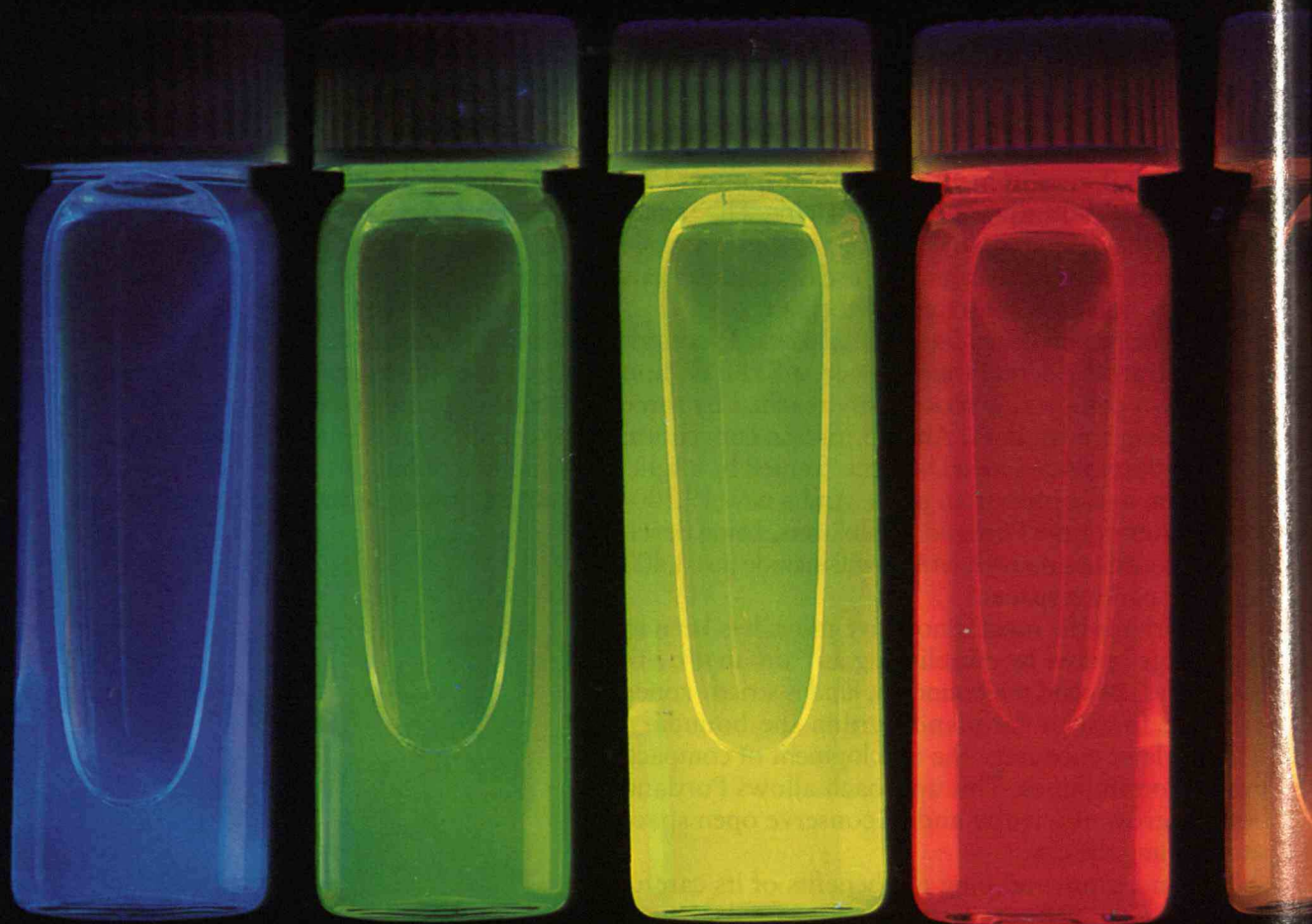
\$900 million in private investment—plus \$440 million worth of planned projects—near transit lines.

Community design schemes like Portland's can be the center of a policy of reinvigorating inner cities, easing environmental impacts, attracting and guiding private development, and adding life to the typical suburban model of strip malls, office parks, and oversized and barricaded single-family lots often criticized as sterile and lifeless. And the bottom line is that it's cheaper. In Portland's case, avoiding several hundred million dollars in highway construction is a conspicuous byproduct of well-considered community-based planning.

This drive toward efficient development can surely be translated elsewhere, and in other areas of infrastructure. Look what has happened in electric power: even though Lovins's calls for efficiency in the mid-1970s were branded a "siren philosophy"—a prelude to a New Dark Age—U.S. Gross National Product climbed more than 50 percent by 1990, while total energy use grew just 9 percent. The energy needed per dollar of economic activity fell by nearly a quarter, mostly because of greater energy efficiency. A combination of market incentives and planning efforts can expand these efficiency gains to water, waste, and travel—reducing pollution, creating more livable cities, and providing hundreds of billions of dollars in savings as municipalities downsize their infrastructure. ■



In Portland, Ore., the MAX light-rail system (left) has proved so successful at cutting auto travel that a former six-lane highway has been supplanted by parkland (above).




Scientific imagery that both conveys information
interest will best en

Truth and Beauty *in* SCIENTIFIC PHOTOGRAPHY

TEXT BY GEORGE M. WHITESIDES

PHOTOGRAPHS BY FELICE FRANKEL



Images are the most valuable tool in science for recording and transmitting information. They are more efficient than words and less stultifying than tables; they are also the most effective means of capturing attention. Images can be aesthetic, or informational, or occasionally both. The Mona Lisa is purely aesthetic; a typical electron micrograph is purely informational. A satellite aerial photograph of a mountain range is informational; an Ansel Adams photograph of the same mountains is aesthetic. The difference between an aesthetic and an informational picture stems partly from the motivation of the persons who record and interpret the image, and

*and elicits aesthetic
all kinds of viewers.*

EXPOSED TO ULTRAVIOLET LIGHT, SOLUTIONS CONTAINING NANOCRYSTALS THAT COULD BE USEFUL IN TELECOMMUNICATIONS DISPLAYS FLUORESCENCE UNDER DIFFERENT WAVELENGTHS AND SHOW UP AS DIFFERENT COLORS. TO CREATE AN INTERESTING EFFECT WITH THE AIR POCKETS, THE PHOTOGRAPHER PLACED THE VIALS HORIZONTALLY.

partly from the presentation of the image. An aerial photograph can be quite beautiful. Ansel Adams's photographs do record geological detail.

The fact that scientific images are usually explicitly designed to be informative rather than beautiful relates in part to cultural preference. Science is puritanical in its view of imaging. Color it gray, add the edge of a rule to give a sense of scale and to remove any aesthetic balance, and arrange image and interpretation as closely as possible along rectangular coordinates. If the eye is seduced by frivolous curves and by attractive color, who knows what errors in rigor of thought might follow? Focus on the text of the hymn rather than on the beauty of its music.

But laziness also plays a role in scientific images that are purely informative. Scientific photography composed to be both beautiful and informative requires greater thought, skill, and discipline than Orwellian-gray images that just serve the routine record-keeping function of research.

Does a rigid and artificial separation between information and aesthetics in scientific images make sense? What do we lose by amputating any hint of the purely beautiful from these images? A great deal. By making images as aesthetically boring as possible, we lose all contact with those not already committed to absorbing the information the pictures show. We lose the opportunity to attract the attention of nonexperts who might otherwise wonder, at least briefly, about

the subjects. We lose the stimulation to imagination and association that aesthetics might bring. We lose information

Beautiful

itself: sometimes an image designed to be beautiful contains more information than one produced routinely.

The photographs in this essay attract the eye and the attention in a way that conventional scientific images would not. And they connect three groups: those who pursue technology for its utility, those who are simply curious about natural phenomena and technology, and those who enjoy a pattern of form and color purely for its beauty.

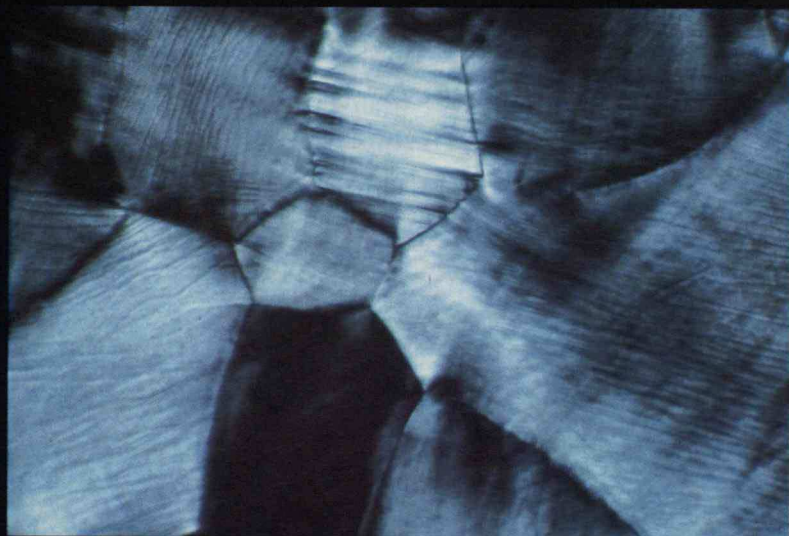
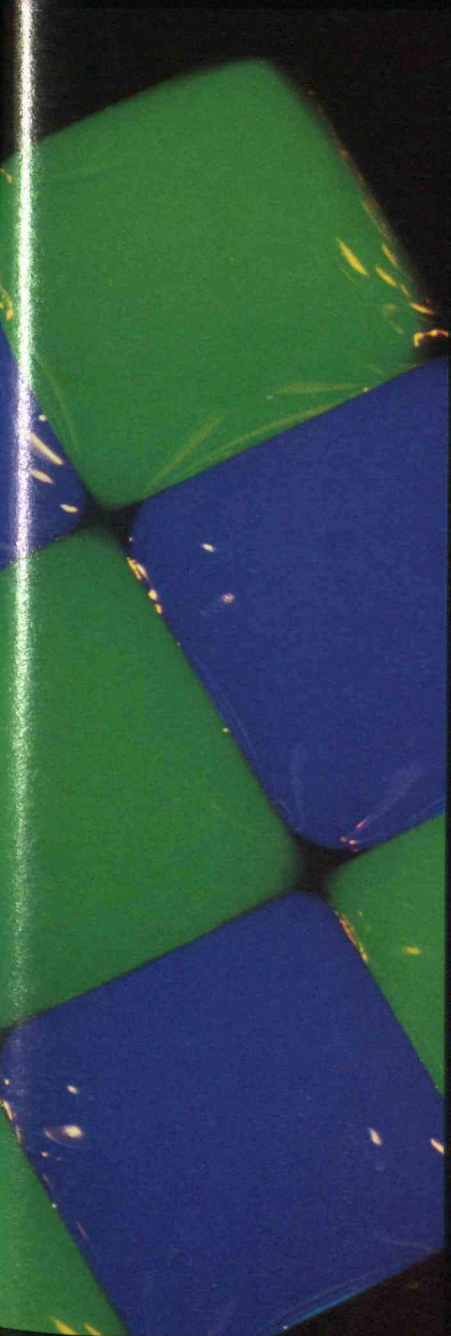
The images also obey the laws of optics and chemistry. Enthusiasm for a flashy picture should not overwhelm honesty. Today, aesthetics that rely on information distorted by digital manipulation can easily be used to trick the eye. Retouched or enhanced images have always been subject to suspicion, of course, although photographs filtered to improve contrast or subjected to edge sharpening to heighten resolution are usually ethically acceptable in science. Completely unretouched images are less susceptible to trickery.

A and B show the pattern formed by four-millimeter-wide drops of water separated by water-resistant material some one-millionth of a meter thick. The monochrome image was generated rou-

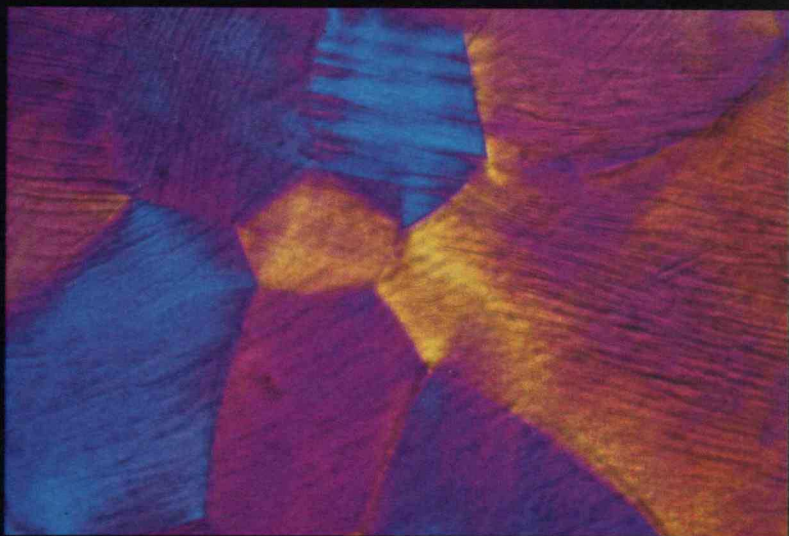
images can do
than photogr

FELICE FRANKEL is artist-in-residence at MIT and a recipient of a Guggenheim fellowship. GEORGE M. WHITESIDES is a professor of chemistry at Harvard University. They are collaborating on a volume entitled *On the Surface of Things*, a portrayal of scientific materials (forthcoming from Chronicle Books).

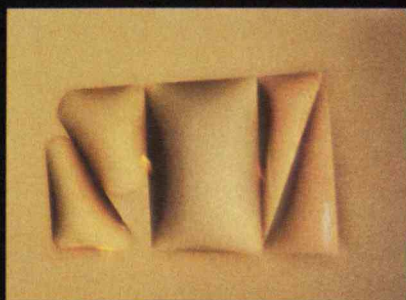
*more information
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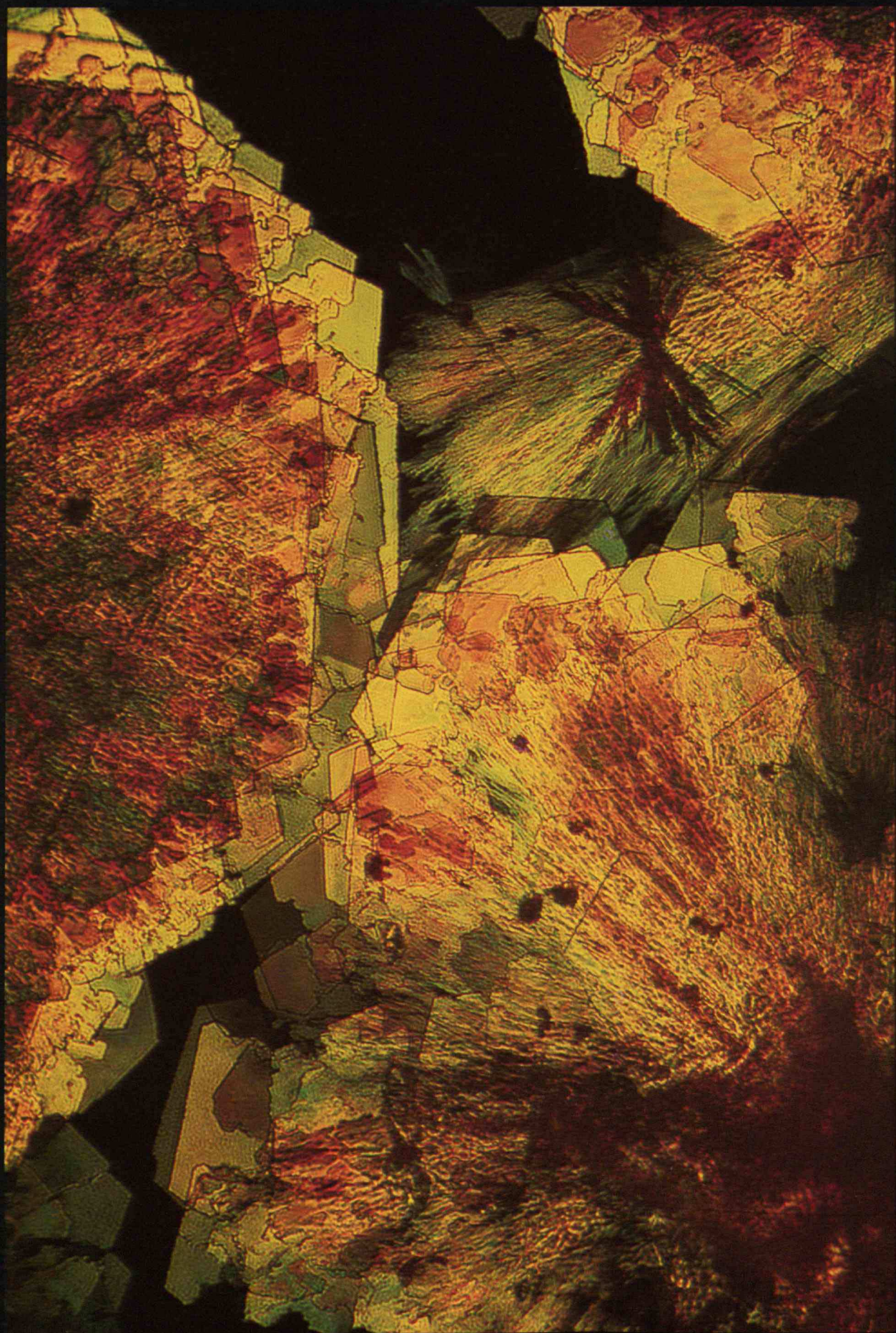
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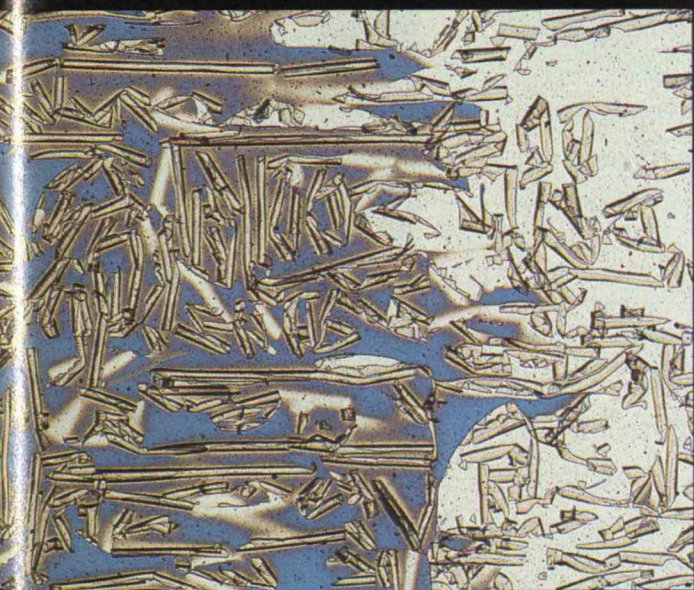


D



B





*Enthusiasm for a flashy picture
should not overwhelm honesty; aesthetics
should not be used to trick the eye.*

tinely as a laboratory record. In the other photograph, dyes label alternate drops, and the angle of lighting generates patterns of reflection internal to the drops. This image is both the more interesting visually and the more informative. The dyes demonstrate little or no leakage of liquid from one drop to another, establishing the integrity of the barriers. The reflection patterns suggest the shapes of the liquid surfaces.

In principle, *C* and *D* contain the same information. They depict a crystal of silver halide that has been stretched and then relaxed. Patterns of stress and internal structure have been made evident through the use of filters sensitive to polarized light. The monochrome image converts the varying directions of polarization into differences in intensity, while the polychrome image alters them into different colors. Because the eye is much more sensitive to color distinctions than to variations in shades of gray, it absorbs more quantitative information in the second image. The colors in *D*, by the way, are not arbitrary but reflect the underlying physical reality we simply cannot normally see.

E relies on visible light to show crystalline order in three clumps of thin, over-

lapping sheets of particles—each one-billionth of a meter in size—of the semiconductor material cadmium sulfide. The colors originate in the same way as those cast off by opal: upon hitting the

material, white light diffracts into various colors. The colors perceived by the eye result from separations between particles too small to be seen directly. This image's colors indicate that the particles occur in regular arrays, and provide measures of the dimensions of the crystalline sheets.

The rubble shown in *F* is a record of a failed procedure. The intent was to deposit a thin polymer film on a silicon-chip surface through reactions involving chemicals in surrounding vapor. The film cracked and peeled away as it formed. The image contains, in its shapes and hues, information about the thickness of the film when it broke off, the dimensions of the film when the accumulated internal tensions caused failure, and the temporal sequence of the catastrophe.

Silicon is now becoming more than a medium for manipulating electrons: it is the preferred material employed in constructing a host of new tiny electromechanical machines, chemical reactors, movable mirrors, and other devices millionths of a meter large. Such uses for silicon require new methods to shape it. One is micro-machining by laser. In *G*, the roughness of the linear patterns formed by that technique suggests the character of the process. The angle at which the image was shot adds further interest.

A different production method leads to a similar pattern of lines in *H*. These depict one-millionth-meter-wide bars of an organic polymer that was generated by allowing the material, when liquid, to wick its way into a

Scientific

photography com

network of fine, continuous capillaries. The regularity of the filling of the capillaries shows clearly in the uniformity in length of the now-solid bars. The subtle interference colors that range across the array reveal unexpected detail: each color reflects the thickness of the polymer.

The manufacturing process of photolithography, which relies on conventional optics, is used to produce most microstructures today. But as the parts of such structures become too small to be produced by this process, new manufacturing methods are beginning to appear. One is microprinting, a process analogous to stamping a return address on an envelope—but conducted on a scale 10,000 times smaller. *I*, a photograph of a stamp used in microprinting, depicts features tiny enough to diffract visible light and conveys the optical transparency of the stamp.

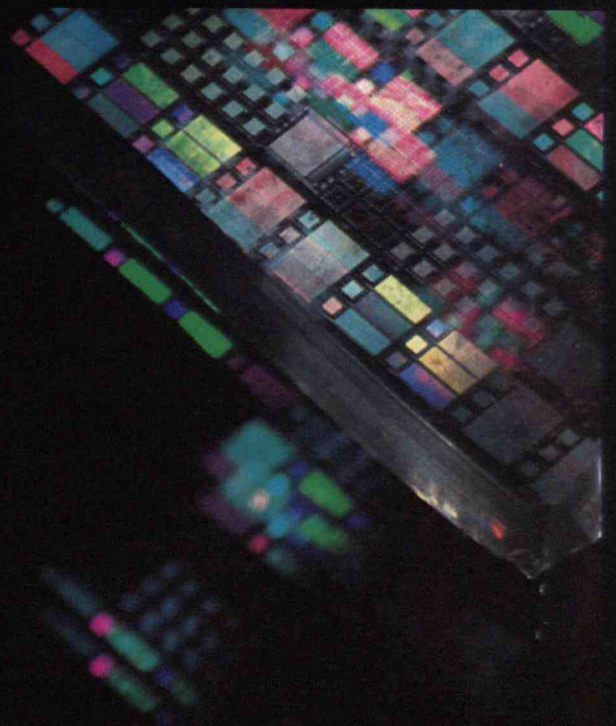
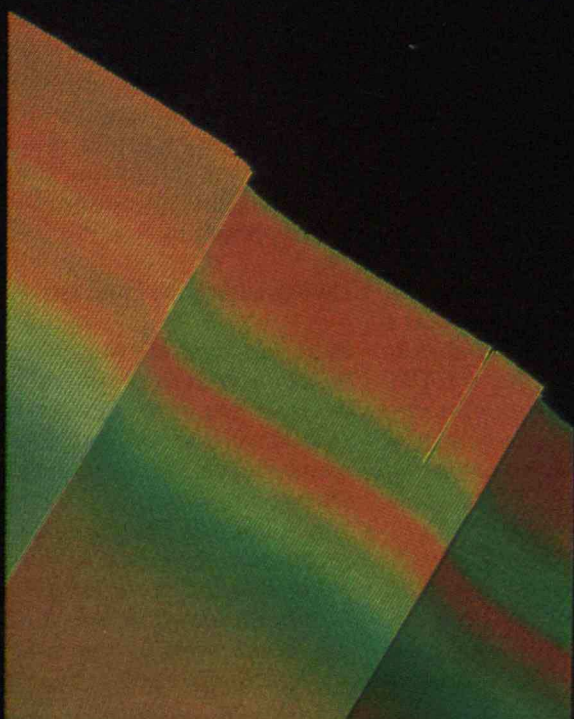
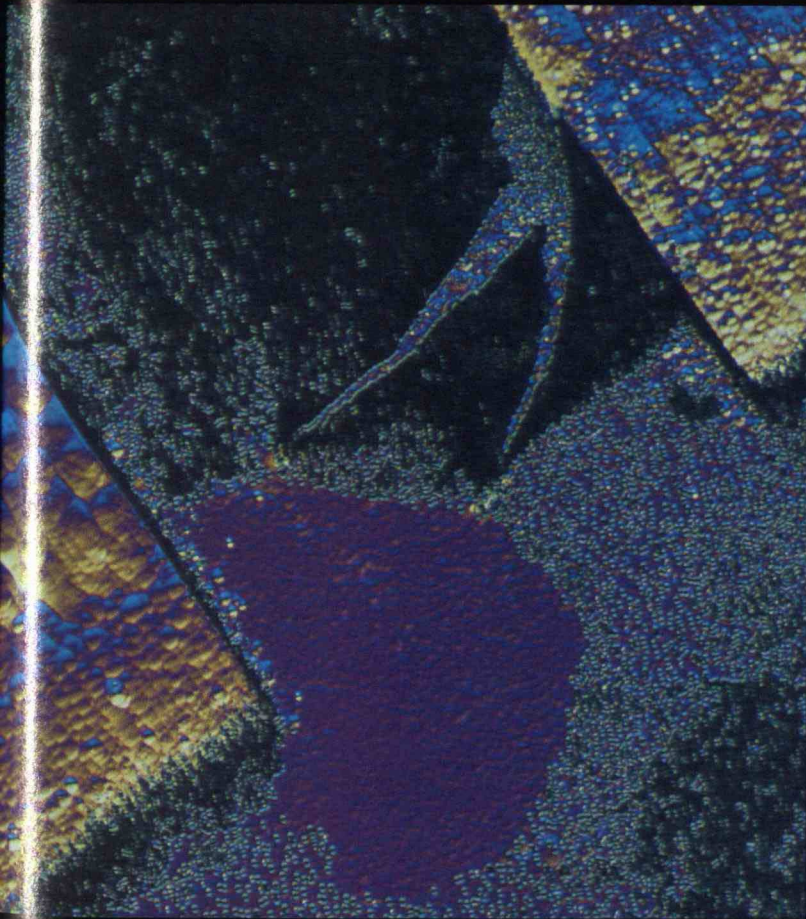
Generating images both beautiful and accurate is more demanding than simple record-keeping. But doing so offers science, and the public, a different way of seeing that can be more valuable. We must practice this art more often.



G

THE IMAGES ARE BASED ON SCIENTIFIC WORK DONE BY: M.G. BAWENDI, K. JENSEN, B. DABBOUSI, AND J. RODRIGUEZ-VIEGO (FRONTIS); N.L. ABBOTT AND G.M. WHITESIDES (A, B); R. CALHOUN (C, D); C.B. MURRAY, C.R. KAGAN, AND M.G. BAWENDI (E); D.J. EHRLICH (F); T. BLOOMSTEIN (G); E. KIM, G.M. WHITESIDES (H); R. JACKMAN, J.L. WILBUR, AND G.M. WHITESIDES (I). N.L. ABBOTT AND G.M. WHITESIDES PHOTOGRAPHED IMAGE B.

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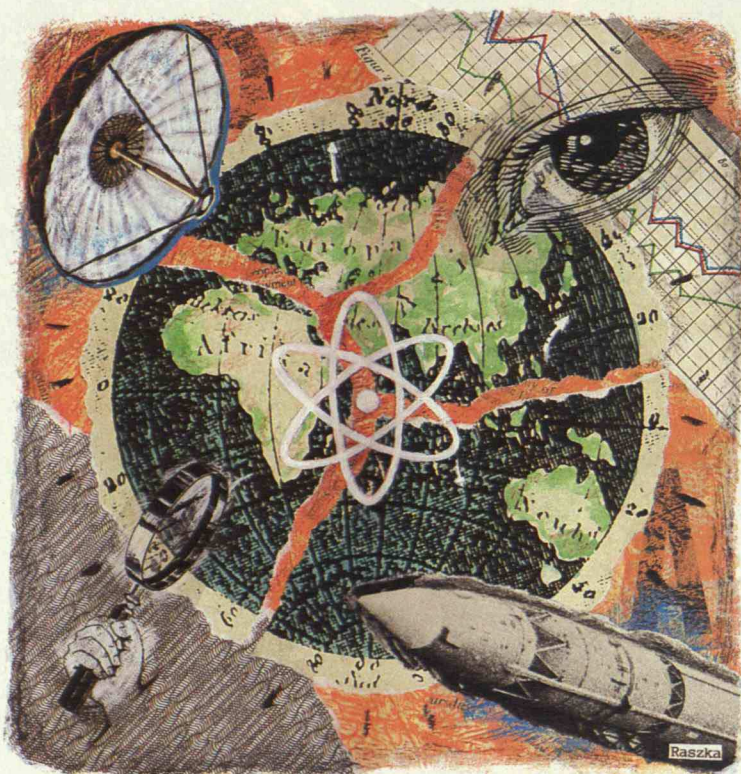


Beyond NPT

THE indefinite extension of the Nuclear Nonproliferation Treaty (NPT) by representatives from more than 180 participating nations meeting in New York last spring marked a major achievement. Most analysts agree that the international norms, inspection system for nuclear facilities, and export controls established by the NPT have persuaded the leaders of many states to reject the option of producing nuclear weapons. Instead of the 15 to 20 nuclear powers forecast by President John F. Kennedy in 1961, the number still stands at less than 10.

Yet the future of the nonproliferation regime remains clouded. Two states that signed the NPT, Iraq and North Korea, violated their obligations and pursued extensive programs to develop nuclear weapons, while Iran, another NPT signatory, has embarked on a similar effort. Meanwhile, three other states that never signed the NPT—India, Pakistan, and Israel—are “threshold” states with at least the capability of developing such weapons. The prospects for bringing these holdouts into the existing NPT regime in the foreseeable future are slim.

Acknowledging these shortcomings, participants at the extension conference emphasized two major initiatives: a global prohibition on all nuclear testing and a ban on producing the plutonium and enriched uranium used to make nuclear weapons. Participants pledged to reach agreement on a Comprehensive Test Ban Treaty (CTBT) in 1996 and a fissile-material cutoff at an unspecified later date.



*Policymakers must act regionally
to stem the proliferation of nuclear weapons
in the post-Cold War era.*

The CTBT effort is well under way. Backers have long championed a nuclear test ban as a means of limiting vertical proliferation (the growth of the nuclear arsenals of the five “nuclear haves”) and as an added barrier to entry for would-be nuclear nations. Now that the Clinton administration has decided to support a complete ban, and France has finished its testing in the South Pacific, a CTBT seems possible. A number of obstacles still remain, including the hesitations of China and conflicts over verification procedures and organizations, but these can be solved.

For more than thirty years, a fissile production cutoff has been seen as another means of rolling back the nuclear arms race. Cold War logic maintained that without additional fissile

material, the existing nuclear weapons states would not be able to produce new weapons. Now, as the United States and Russia dismantle much of their nuclear arsenals, both will have tons of fissile material in storage, so a cutoff will have symbolic importance rather than substantive impact. As a result, some proponents of a cutoff have sought to refocus this initiative to freeze and perhaps roll back the nuclear programs of the three major NPT-holdout states (India, Pakistan, and Israel). This is also seen as a first step toward getting these states to accept the NPT and international inspection.

However, neither the CTBT nor the cutoff will adequately address the perceived security problems of these three states. They maintain that nuclear weapons are vital to their national security

and survival amid heavily armed neighbors. Addressing proliferation among these nations will require a shift from the global emphasis to specific regional security problems.

Understanding the Holdouts

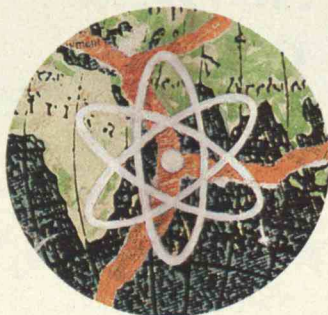
India and Israel are wary of the global fissile material cutoff initiative, seeing this effort as an attempt to force them to abandon their nuclear deterrents without addressing the threats to their security. (Pakistan has accepted the concept of a cutoff, but only if India agrees to apply it retroactively so that both India and Pakistan would be nuclear free.)

India's leaders have long feared a division of the world into nuclear “haves” and “have nots,” despite Gandhi's legacy

of nonviolence and the country's early policy of "nuclear abstinence." The Indian military also views China as a military threat and has sought to develop its own nuclear capability ever since China detonated a nuclear weapon in 1964. India's nuclear efforts increased after the 1971 war with Pakistan amid fears of a "Pakistan-China-U.S. alliance," and successive governments have declared that India cannot and will not renounce a nuclear option until China does the same. Indeed, U.S. satellites recently detected preparations for a possible Indian nuclear test.

Just as India is concerned about China, Pakistan worries that India is a threat to its survival. The Indian nuclear test of 1974, and reports that India has stockpiled up to 100 nuclear weapons, accelerated the Pakistani nuclear program. The late Prime Minister Zulfikar Ali Bhutto declared that Pakistanis would "eat grass" rather than surrender their nuclear option. Pakistan is now credited with at least a small nuclear arsenal, and any change in nuclear policy depends on a similar move by India.

Meanwhile, Israel has never acknowledged developing nuclear weapons and carefully fosters ambiguity about its capabilities. Despite the peace process now under way, Israel remains concerned that a combination of armies from neighboring states could overwhelm it and reach Tel Aviv. Before the 1991 Gulf War, the Iraqi army alone possessed more than 7,000 tanks, thousands of long-range guns, hundreds of modern combat aircraft, and more than 50 active divisions, not to mention chemical weapons, deadly biological warheads, and ballistic missiles. According to Rolf Elkeus, who heads up the U.N.'s inspection team, Saddam Hussein was less than a year away from developing his own nuclear capability. The threat of Israeli retaliation deterred Iraq from using its chemical and biological warheads in 1991, and as Iran continues its efforts to develop a nuclear weapon, the Israeli deterrent will become important there as well. In this hostile environment, efforts to persuade Israel to relinquish its



"weapon of last resort" are unrealistic.

Given the mutual threats in the Middle East and South Asia, it seems clear that the holdouts will not change their policies without regional agreements that address their underlying security concerns.

What should such regional security arrangements include? In 1988, the prime ministers of India and Pakistan signed an agreement pledging not to attack each other's nuclear installations. Although implementation was delayed by clashes in the Kashmir region in 1991, the two countries exchanged lists of nuclear-power, research, and enrichment installations in January 1992. Progress is slow, but officials have held discussions on establishing a South Asian Nuclear Weapon-Free Zone. Beijing will eventually have to be brought into this framework as well. China is unlikely to give up its nuclear weapons until the United States and Russia do the same, but limitations on the size of its arsenal and other regional security measures could provide a basis for cooperation.

In the Middle East, the Arab-Israeli peace process includes a working group on Arms Control and Regional Security. Representatives from Israel, Egypt, Jordan, Algeria, Kuwait, Saudi Arabia, Qatar, and other states in the region have met frequently over the past three years to discuss confidence- and security-building measures. Examples include crisis communications centers that would allow leaders to converse directly, and an agreement to notify neighboring states of any large military exercises. (However, Syria, Iraq, Iran, and Libya are boycotting these talks, with the latter two

condemning the entire Arab-Israeli peace process and clinging to demands for the destruction of Israel. Syria might agree to join the regional talks if the country reaches a bilateral peace agreement with Israel, but the radical governments in Iran, Iraq, and Libya will likely have to change before these states participate.)

The talks could address limits on conventional weapons as well as cutbacks in chemical and biological weapons and nuclear warheads. Israel and Egypt have already endorsed the concept of a Middle East Zone Free of Weapons of Mass Destruction, based on mutual inspection. Such a zone could offer the participating nations a higher degree of assurance than that offered by the existing NPT regime, in which the verification process is politically filtered by the Geneva-based International Atomic Energy Agency.

Ultimately, such comprehensive regional security frameworks could provide alternative arrangements that would convince the holdouts to accept limits on their nuclear programs. But participants in these regional negotiations must end the artificial separation between nuclear and conventional weapons, addressing also the contribution of conventional arms sales (including those from the United States) to the regional instability.

The final declaration of the 1995 NPT Extension Conference recognized that "the establishment of zones free of all weapons of mass destruction should be encouraged as a matter of priority, taking into account the specific characteristics of each region." Efforts to force the three holdouts into the existing global regime, and to use the fissile material cut-off initiative for this purpose, are inconsistent with this policy. For these states, the only realistic approach is to build serious regional security arrangements that include limits on conventional and nonconventional weapons alike. ■

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THE science and engineering enterprise faces a dilemma. How can it maintain its deserved image as a prestigious and selfless community while at the same time using tactics common to other, less exalted constituencies to seek the financial support it needs to survive and flourish?

Scientific interest groups are now mounting bold advocacy efforts—actions that have been much in evidence during the difficult budget negotiations for fiscal 1996. When the outstanding in-house laboratories of the National Institute of Standards and Technology were under attack, for example, Nobel Prize winners successfully came to their support. High-energy physicists came to the defense of activities in their discipline supported by the Department of Energy. And when the House sought to cut the National Institutes of Health's biomedical research programs, advocacy groups and NIH champion Sen. Mark Hatfield, chair of the Senate Appropriations Committee, came to their rescue, eventually restoring some \$800 million of the proposed budget cuts.

In truth, scientists and engineers have long exercised substantial influence on federal funding of their activities, largely as advisers to agencies, Congress, and the White House. Organizations such as the National Academies of Sciences and Engineering and the Institute of Medicine issue hundreds of reports each year, many of which have significant budgetary impact. The Engineering Research and Science and Technology Centers of the National Science Foundation, for example, owe their existence to just such advisory reports. Universities have long had advocacy mechanisms, working through organizations such as the Association of American Universities (AAU). Still, the public perception remains that science and technology are largely above the political fray.

That image is changing. Ever since the 1986 Gramm-Rudman-Hollings legislation ushered in an era of funding caps and attempts at deficit reduction, scientific advocacy efforts have intensified. Almost every university represented by the AAU, for example, is now staffed

The Science Advocacy Dilemma

Organizations representing science and engineering are now pushing as hard as anyone else for their piece of the federal budget pie.

But at what cost?



ROBERT M. WHITE

with professionals specializing in congressional and governmental relations. We are now seeing a growing number of advocacy efforts by groups of institutions. The Ad Hoc Group for Medical Research Funding, for example, is a coalition of more than 130 medical and scientific societies, voluntary health groups, and academic and research organizations dedicated to increasing support for biomedical and behavioral research. For fiscal 1995, this group made no secret of its attempt to lobby Congress for an additional \$1 billion for the National Institutes of Health over and above the approximately \$11 billion that Congress had appropriated for the previous year. Similarly, 55 organizations have joined forces in the new Coalition for the National Science Foundation, whose purpose is to support NSF's programs and

budgets. Other coalitions, such as the Consortium for Oceanographic Research and Education, are organized less around particular agencies and more around research disciplines.

Some of these groups have attempted, during the appropriations process, to add, or "earmark," funds for programs, projects, and facilities that have not been peer-reviewed and that are not included in the president's budget. The House Science Committee indicates that the total amount of earmarked funds (in current-year dollars) has exploded from about \$11 million in 1980 to \$875 million in fiscal 1995.

The proliferation of advocacy groups is worrisome. While the various fields of science and engineering share a common culture, they are vastly different in their needs and aspirations. It is natural that each discipline seeks to assure its own advance by securing adequate resources—telescopes for the astronomers, accelerators for high-energy physicists, biomedical laboratories for genome researchers, and so on. But every scientific discipline has a responsibility not just to its own well-being but to that of science as a whole. Such broad allegiance reflects the tight interdependence of what amounts to an ecology of science. Astronomers need electronics and optics, for example; biomedical researchers exploit the fruits of materials engineering; and advances in computing and information technology benefit the enterprise broadly.

Neal Lane, director of the National Science Foundation, expressed this concern well at a recent meeting of the American Association for the Advancement of Science. "We must be careful," Lane warned, "not to give in to our individual instincts to save ourselves at the cost of others." Internecine conflict among scientific disciplines could have dismal consequences for the overall science and technology enterprise. ■

ROBERT M. WHITE is president emeritus of the National Academy of Engineering and senior fellow at the University Corporation for Atmospheric Research (rwhite@nas.edu).

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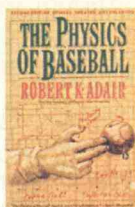
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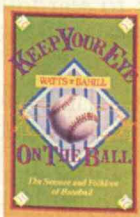


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THE outlook wasn't brilliant for the human race that day; the score stood one to zero with five innings more to play. As a crestfallen Garry Kasparov walked away from the chess board, defeated in his first match with IBM Deep Blue, many in the audience whispered, "Has the moment come? Is the world champion no longer equal to the best computer?"

For sheer drama and intensity of competition, the standoff in Philadelphia this February exceeded any Super Bowl or World Series I've ever seen. Here was the contemporary Babe Ruth of chess, arguably the greatest player in the history of the game, going one-on-one with the product of decades of human technical ingenuity. The \$400,000 prize to the winner was a mere shadow of the real stakes in the match. The IBM programmers explained that they were playing for the glory of scientific research. Kasparov, chess romantic if ever there was one, made it clear that he was defending the very honor of humankind.

The excitement was amplified by live coverage of the games on the Internet. Hundreds of thousands of people from all over the world tuned their Web browsers to the match, receiving up-to-the-minute moves, sound bites, and color photographs. As the tension mounted for several hours each day, even this Internet skeptic had to recognize the Web had spawned a novel cultural event.

While I am not an avid chess fan, I found the online commentary riveting. Chess experts Maurice Ashley and Yasser Seirawan reported the action with lively, good-humored patter, noting the significance of each move and the opponent's likely response. The commentators sprinkled their remarks with stories from chess history, analyses of the classic strategies, colorful musings on human psychology, and philosophical questions about artificial intelligence. After a particularly nice move by Deep Blue, the hosts debated the question of whether the computer "knows it's playing chess." When Kasparov's hopes sank in game one, Ashley suggested it was time to go backstage and "pull the plug."

It Plays Like God

The computer analyzed millions of chess moves per second.

The human adapted and triumphed—postponing an inevitable day of reckoning.



LANGDON WINNER

It soon became clear that Kasparov had learned from his initial drubbing and had adopted a new strategy. Because Deep Blue can analyze 50 billion moves every three minutes, a human player must avoid giving it even the smallest opening, especially in the endgame where the computer's sheer power of calculation makes it a relentless foe. For Kasparov that meant playing his pieces in a guarded, tightly organized offense, using intuition and experience to avoid positions where his opponent could exert its brute force. Acknowledging the computer's strengths after his win in game two, Kasparov observed: "In some positions it plays like God because it simply does not make mistakes."

The turning point came in the fifth game with the score one to one and two draws. Early in the match, Kasparov examined his position and offered Deep Blue's team another draw (the machine

itself did not make such decisions). But in the name of science, and perhaps out of sheer hubris, the IBM scientists decided to play on. Seizing the opportunity, Kasparov launched an ingenious attack and pulled out a victory, moving on to vanquish the computer handily the next day.

As a reflection of today's widespread worries about computers absorbing jobs and disturbing the social landscape, the match carried heightened significance. In his post-game comments, Kasparov sometimes sounded like a worker trying to negotiate a compromise with oncoming automation. He suggested that the rules of chess would have to be revised in future human/machine contests. The computer's tremendous speed, he complained, placed him under nerve-wracking time pressure; the game would be fairer if the machine were turned off "while I'm thinking." Kasparov also suggested that human players in future matches have access to the same massive database of chess moves that the computer uses to guide its every decision.

The day will inevitably come when a version of Deep Blue, or a computer of some other pedigree, will defeat the greatest human player. In future decades, Kasparov's victory of 1996 may be regarded as Humanity's Last Stand, noble but ultimately doomed, an echo of John Henry's race with the steam engine. For now, that day of reckoning has been postponed. We can take solace in the fact that Kasparov's victory hinged on his uniquely human ability to learn and adapt—a skill at which our machines pitifully lag.

Somewhere in this favored land, monitors are shining bright. Soundboards are playing somewhere, bits travel at the speed of light. Somewhere nerds are laughing, somewhere programmers shout. But there's still some joy in Mudville: mighty Kasparov did not strike out. ■

LANGDON WINNER, author of *The Whale and the Reactor*, is director of the graduate program in Science and Technology Studies at Rensselaer Polytechnic Institute (winner@rpi.edu).

Reviews

BOOKS

TECHNO-UTOPIST FANTASIES

NANO, the Emerging Science of Nanotechnology
by Ed Regis
Little Brown, \$23.95

BY ROBERT J. CRAWFORD

REPORTING on high-tech gurus has become a popular subgenre of science writing. Over the last few years, authors of these “techie cult” books have evolved a tediously familiar formula: find a flamboyant researcher, broadcast that researcher’s claims, explain a little about the technology behind it all, and then move on. The techno-utopian rhetoric about how newly liberated sources of energy will help end disease, poverty, and the drudgery of industrial labor is easily lifted from one discipline to the next.

In *NANO, the Emerging Science of Nanotechnology*, science writer Ed Regis plugs “nanotechnology”—engineering on the scale of a billionth of a meter—into the techie-cult market, and indeed, the formula appears to apply handsomely. For his high-tech guru, Regis has chosen one Eric Drexler, whose vision is nothing if not arresting. Drexler, who holds the first PhD in nanotechnology from the Media Lab at MIT, has written a series of speculative books on the “unbounded” future that nanotech promises; he also founded the Foresight Institute, which promotes his techno-utopian agenda. Individual atoms, Drexler argues, should be treated as the bricks and mortar for a new style of ultra-miniaturized robotic technology. Engineered in the correct way, tiny, self-replicating robots, some perhaps only a few atoms in diameter, theoretically could be programmed to



harness chemical energies and offer us complete control of matter and nature.

Regis reports that if only we take Drexler seriously, “nanosystems” will soon be able to transform anything—dirt, toxic waste, or moon rocks—into whatever we choose, atom by atom. A “molecular cornucopia” could synthesize slabs of beef on command when fed the required elements of carbon, hydrogen, iron, and other constituents of protein and fat; when reprogrammed, the system would spit out rocket engines or perfect replicas of Victorian antiques. “Everyone alive could have [a molecular cornucopia],” Regis writes, “The world could look forward to an era of sustainable growth, responsible use of natural resources . . . Each machine would use, as raw materials, only as many individual atoms as were required.”

Other applications of nanotechnology would supposedly make our cities obsolete: floating microscopic robots “with lots of arms and hooks sticking out every which way” would compose a system that could turn itself into “ancient Rome one day and the Emerald City the next.” And a cadre of “terraforming nanorobots,” transported and released on Mars, could self-replicate and somehow mine enough oxygen from rocks to allow humans to colonize

the planet. Just as interesting, we would become immortal: nanosurgeons injected into the bloodstream could repair the human body at the cellular level, eliminating not only disease but human aging.

Evocative Rather Than Analytical

However, as even Regis admits, Drexler and his followers at the Foresight Institute have virtually no idea how any of this will be done. Although Drexler refers vaguely to gene-splicing tools and “scanning tunneling microscopes,” devices that can map the shapes of single atoms, he mostly ignores the real work of engineering nanosystems, opting instead to ponder the social consequences of these imaginary technologies. What will humans do when, equipped with molecular cornucopias, they no longer need to work? he asks. How can we prevent self-replicating nanorobots from proliferating uncontrollably, turning the entire world into “grey goo” in a matter of days?

Ironically, too, the researchers who should be most interested in Drexler’s ideas have become his fiercest critics. Chemists such as MIT professor Robert Silbey point out that individual atoms are extremely difficult to handle, and that they behave unreliably. Although IBM researchers were able to spell “IBM” by dragging atoms into position with the probe tip of a scanning tunneling microscope, their tools are far too crude and slow to construct the nanomechanical devices that Drexler envisions. Also, the structures these tools do build are so small that the expansion of the substrate that occurs with even the most minute variations in temperature can deform them. And according to Heisenberg’s uncertainty principal, atoms are not always where you expect them to be, so that no one can predict whether certain configurations of them will appear at all. Finally, even if nanodevices are successfully designed, they may never be able to perform the complex tasks that Drexler would assign to them. For

example, if nanosurgeons are to be programmed to repair human cells, we ourselves will have to do the programming, and so far our understanding of the human body is much too primitive.

Rather than confront such difficulties, Regis, like a long line of techie-cultists before him, accuses his guru's critics of "resisting" some new paradigm, which he never clearly defines. "What a Greek chorus of woe it was!" he writes. "The carping! The moaning! The gnashing of teeth. But that was the way of the paradigm shift. Those moans were the last gasps of . . . a viewpoint that would soon be extinct." Another well-worn ploy he uses is to substitute florid rhetoric for substance. Regarding Drexler's technical book *Nanosystems*, Regis writes: "There were huge, overpowering

mountains of [technical ideas], avalanches of facts . . . There were no less than 450 separate equations, formulas, and various collateral inequalities, variations, and transformations scattered throughout the text."

But the worst problem is that the core of Regis's argument is the kind of reverse proof typical of techie cultists. Rather than demonstrating an idea's viability with experimental prototypes, as working engineers commonly do, these proponents challenge skeptics to prove that the technology will forever be impossible to build. Stranger still, the notion that the technology may not forever be impossible to build is seen as evidence that it inevitably will be built. A variety of other unrelated advances can then be presented as harbingers, even if the mainstream scientists responsible for them hold the Foresight Institute in low esteem. To this end, the pioneering work of MIT chemist Julius Rebek, Jr., who created the first synthetic self-replicating molecules, is briefly examined; so is the "artificial atom" of AT&T researcher Raymond Ashoori, who used a magnetic field to trap electrons inside a gallium arsenide crystal.

Regis would have done well to examine the difficulties and failures of scientists like Rebek and Ashoori, which could say something about the true prospects for nanosystems. He also might have taken a look at other work, including studies at the National Institute of Standards and Technology, where researchers experimenting with wires only two atoms thick could be paving the way for computer chips so small as to be invisible to the naked eye. But since he chose instead to follow a simple techie-cult formula, his excursions into nanotechnology are evocative rather than analytical. His book, like a welter of others, misleads interested lay readers with techno-utopian fantasies while neglecting an array of exciting—and realistic—technologies under development. ■

ROBERT J. CRAWFORD is assistant director of the Office for Sponsored Research at Harvard.

PATENT DISTORTIONS

As a registered patent practitioner, I agree with the premise of Seth Shulman's "Patent Medicine" (TR November/December 1995) that the U.S. Patent and Trademark Office (PTO) often issues patents that are too broad, and that there are problems with patent protection as it applies to software.

But the author should have made his arguments with facts rather than distortions.

For example, I was surprised by John Barton's description of certain broad claims as bad because they are "monopolistic." A patent by definition is a time-limited monopoly granted to encourage individuals and companies to share their inventions with the public. Without patents, new developments would have to be kept secret.

Also, Shulman's claim that the most experienced patent examiners are promoted to the Board of Appeals "to deal with the multitude of software lawsuits" is wrong. The board deals with the internal decisions of other examiners; it has nothing to do with lawsuits or software issues. What's more, the author refers to the protracted lawsuit between Apple, Microsoft, and Hewlett Packard as patent litigation when, in fact, it was a copyright case. Finally, Shulman suggests that the U.S. patent process could be harmonized with its foreign equivalents by allowing patents to run 20 years from the filing date rather than 17 years from the date of issue, but that idea was implemented months before this article appeared.

DONALD R. BOYS
Central Coast Patent Agency
Aromas, Calif.

Blaming the patent system for the proliferation of high-tech litigation is simplistic and unfair. There is just as much high-tech litigation involving software and



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copyright. Witness *NEC v. Intel*, involving the copyright to the microcode in a microprocessor, and *Lotus v. Borland*, questioning the compatibility of macros.

The PTO is no different from any other institution. Imperfections are due to the frailty of its human caretakers, and examiners need time to become trained in any revolutionary technology. The fact that the PTO recognizes its imperfections and has mechanisms to respond should be seen as its virtue, not as its vice, and should not be taken as an indictment of the system.

RONALD L. YIN
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The article's reference to the lawsuit between REFAC and Lotus incorrectly characterizes REFAC as a "software firm." REFAC is a licensing company that works on behalf of individual inventors and small companies to protect their patents. The patent that REFAC asserted against Lotus belonged to individual inventors. After trying unsuccessfully to license their patent to companies in the spreadsheet business, the inventors turned to REFAC for help.

HERBERT R. SCHULZE
Intellectual-Property Counsel
Hewlett-Packard Co.
Palo Alto, Calif.

Shulman himself refutes his incorrect allegation that patent examiners are grouped in an antiquated manner by referring to an examiner whose specialty is fluid dispensing. By claiming that the PTO's filing system has not changed considerably since its creation by Thomas Jefferson, Shulman also disregards the office's detailed breakdown of fields and a computerized searching capability that cuts across classification boundaries.

As an examiner in the PTO from 1942 to 1953, a patent lawyer from 1953 to 1987, and an inventor, I do strongly agree with the proposal to award U.S. patents to the first person to file rather than the first to design an invention. The rules of the latter system

are so technical that they often award the patent to the wrong inventor. The only beneficiaries are patent lawyers who charge high fees for their services.

ALVIN GUTTAG
Gaithersburg, Md.

As an intellectual-property attorney, I specialize in protecting, enforcing, and licensing software-related inventions. I also teach a class that is directed at many of the issues touched on by Shulman in his insightful overview of the U.S. patent system.

I found the article on point with many of the frustrations confronted by my clients and others involved in protecting their software-related inventions under U.S. patent law. Unfortunately, the law does not necessarily evolve at the same pace that technology does. Shulman's article successfully identified how and where this form of protection may not appropriately address the peculiarities of software-related inventions.

JONATHAN E. RETSKY
Chicago, Ill.

STABILIZE POPULATIONS

In "Averting a Global Food Crisis" (*TR November/December 1995*), Lester Brown highlights the impending

food shortage world-wide and, like many, proposes technical fixes such as converting land presently used for tobacco or cotton, making more efficient use of water resources, and rationing the use of livestock products.

But at the same time, he points out that if all these measures were fully implemented—a monumental task to say the least—they would only provide enough grain to support the growth in world population for several years. Aren't such recommendations clearly myopic?

Unless burgeoning populations are actively stabilized, buying time through

temporary technical fixes merely conceals the problem. Worse yet, it artificially supports an increasing population and promises to make the eventual collapse even more disastrous.

ALLEN R. INVERSEN
Riverdale, Md.

NO WINNER WEB SITES?

In "Aristotle Needs a Web Page" (*TR November/December 1995*), Langdon Winner's denunciation of the World Wide Web as filled with "horse manure" would be more credible if he himself had contributed something that improves the Web's content. A perusal of the Web site for the Department of Science and Technology Studies at Rensselaer, where Winner works, shows no pages from him. This would be the relevant place for him to make his point. Even a list of his favorite sites could help improve the experience of the surfers who encounter a lot of junk on the Web. But complaints in the absence of action will not change much. A positive example of quality content is in order.

JOHN HINSDALE
New York, N.Y.

MATHEMATICALLY SIGNIFICANT

Arnold Barnett's review (*TR February/March 1996*) of my book *A Mathematician Reads the Newspaper* was somewhere between nit-picking and point-missing. He devotes much of his review to alternative interpretations of some of the news stories and statistics in the book. This kind of kibitzing can be tempting, but in the interest of brevity I'll resist the urge to meta-kibitz. The point is that I didn't strive for definitiveness in the vignettes. Indeed, one of the implicit lessons of my book is that such definitiveness is often unachievable or reductionist. The book's primary purpose was to point out some of the myriad ways in which mathematical and quasi-mathematical notions underlie and at times clarify topical issues ranging from crime and cults to sex surveys and the Senate.

JOHN ALLEN PAULOS
Professor of Mathematics
Temple University
Philadelphia, Pa.

Continued on page 72



Classifieds

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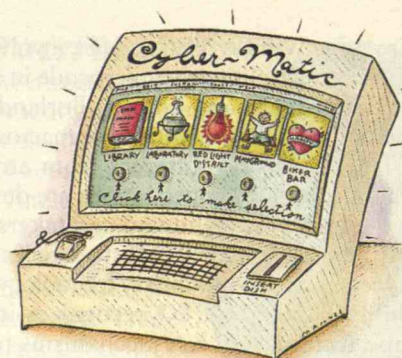
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FINDING THE RIGHT NEIGHBORHOOD

I agree with Amy Bruckman's observation in "Finding One's Own Space in Cyberspace" (*TR January 1996*) that "much of the Net is like the Sportsman [a raucous biker bar] and too little of it is like Maria's [a friendly Italian eatery]." Many newcomers to the Net expect virtual communities to be more like Maria's and are shocked at the overwhelming disorder and chaos they find instead.

Consider the gentrification of the Old West as a model for cyberspace. "City folk" came to the frontier with high expectations. Upon perceiving "flaws," they set out to change things more to their liking. As the earlier settlers resisted these changes, the gentry resorted to more aggressive and formal tactics including overwhelming economic pressure, onerous laws, and tougher policing. (Does any of this resemble recent changes to the Net?)

Bruckman suggests that people should "get back on the bus" if they encounter an incompatible virtual culture. Instead, I suggest that mechanisms should be in place to immediately redirect that person to a more compatible place. Bruckman does exactly that on MediaMoo, the online community for media researchers that she established. Her standard "rejected application" form offers several alternate destinations that might be more to the user's liking.

F. RANDALL FARMER
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Phenomena

BY DAVID BRITTAN

Let Them Eat Toast

THE bad-news phone call of the week begins with the static hiss and metallic echo I've come to associate with trouble brewing across the Atlantic. Is it a British writer demanding payment? An Italian scientist asking after a manuscript she submitted weeks ago? No, it is a pleasant-sounding voice announcing: "This is the BBC, in London." I am slightly disoriented to hear these words uttered over the telephone instead of the radio—the words that sped the delivery of coded messages to resistance fighters in World War II, the words that punctuated blow-by-blow accounts of bomb damage in the Persian Gulf. One cannot receive a phone call from the BBC without imagining, at least for an instant, that one is being chosen for a role in events of historic proportions. But today the BBC has something less earthshaking on its mind. A young woman I'll call Cecily inquires, "Is there really a printer that makes toast?"

I have to think for a minute, for there is no simple answer to this question. Certainly I have said there is a printer that makes toast. A recent *Phenomena* (February/March 1996) states: "Say It With Toast, a 300-dpi color bubble-jet machine, uses edible dyes to transform an ordinary slice of bread into an eye-popping panorama or a distinctive business card. What better way to say 'I love you' than with a plateful of piping-hot Flemish masters." This claim is supported by an illustration showing two slices of

toast popping out of a "toaster/printer"—one bearing the *Mona Lisa* and the other a Picasso-esque portrait. So in the sense that a technical description and a schematic drawing have appeared in a reputable periodical, then, yes, there is a printer that makes toast. Conceptually speaking.

Would this conceptual, hypothetical printer gain legitimacy if I were to mention the newer monochrome version, in which lasers differentially illuminate the surface of the toast, etching images of stunning realism and depth? Then there would be *two* printers that make toast—competing designs waiting to be unleashed in the marketplace of gustatory display technology. But again, only on paper.

I am forced to consider that the BBC may be too busy saying "Boutros Boutros-Ghali" and "Tadzhikistan" to concern itself with these philosophical subtleties. Perhaps Cecily wants to know if the printer exists in the *physical* sense—in the sense that an actual machine prints actual pictures on actual toast. Now I'm wrestling with the limits of knowledge: a credible magazine has reported that it is so, I see no obvious reason why it should not be so, yet I have not technically seen such a device or met anyone who has. So is there a printer that makes toast? I weigh my words carefully. "No," I reply.

The silence on the other end is longer than I anticipated, longer than the usual satellite

delay can account for. I go on sheepishly, "The toaster/printer is fictitious. There's no such thing." Cecily is not receptive. "Oh, no!" she says, her voice tracing a sad little parabola.

Suddenly I'm struck that if the BBC believed the one about

the toaster/printer, it probably believed the one about the wallet-sized "personal A T M," and the one about the "interactive sneakers" with the list of

programmable destinations, and the one about the loudspeakers that punch people's ears with boxing gloves. Full disclosure seems like the only way to go. I explain to Cecily that all the products mentioned in that particular *Phenomena* column are complete fabrications. "I just made them up," I tell her. "They were meant as a..."—gosh, the word always sounds so feeble when the other person isn't smiling—"they were meant as a joke."

This time the silence is even longer. "Oh, no-o-o-o!" moans Cecily, her voice now arcing through several octaves of disappointment. "Oh, no-o-o-o-o-o!"

It is slowly dawning on me that something big, something colossal and momentous and probably quite expensive, is hanging in the balance. A wager, perhaps. "I say, Basil, do you know the Americans have invented a printer that makes toast?" "Oh, Cecily, you're so gullible sometimes." "No, honestly." "A fiver says they haven't." "A tenner." "A hundred." "A thousand." "A million." "A thousand million." "Right, then, a

thousand million quid."

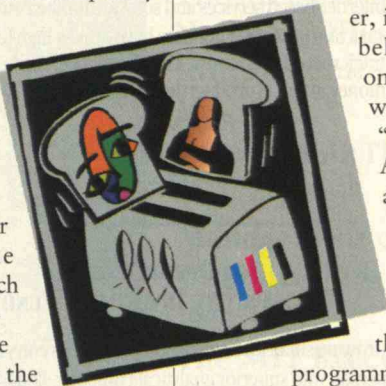
Or royal intrigue—say, a frantic phone call from the Palace reporting that the Queen Mum refuses to get out of bed until she has had some of the new American toast. Does the BBC know of any such thing... important to avoid scandal... all very hush-hush... bound to be remembered when the queen compiles the honors list.

Or is career advancement at stake? "Jolly good scoop on that toaster story, Cecily. If it's on the level, you could be up for a transfer to Silicon Valley." "And if it's bogus?" "Can you say 'Tadzhikistan'?"

Whatever the explanation, it is apparent that my little attempt at satire has somehow brought the BBC to its knees. I find that when humor backfires, the best policy is usually to go for more humor. So after another of Cecily's oh-no's, I venture brightly, "Don't tell me you've planned a half-hour news program about all those new American technologies." The connection is bad, and our voices sometimes blot each other out; I can't be sure Cecily has heard me correctly. But her reply is unmistakable: "Um... yes."

After we sign off, I go through a minor existential crisis. All I try to do is bring laughter to the downtrodden masses of scientists and engineers. I just want to make people *happy*. Now I've gone and made complete fools of the world's largest news-gathering organization, creating no end of disruption and embarrassment, and possibly causing their reporters to think twice before they accept ridiculous-sounding technologies as fact. Is it really worth it?

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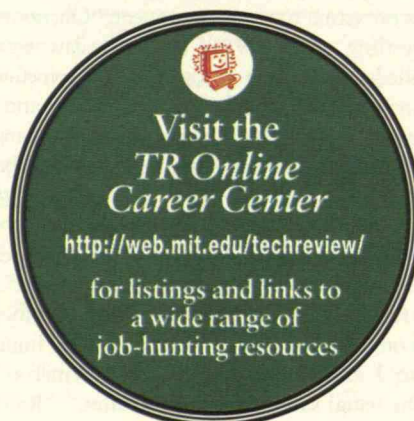
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